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GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. **Give corporate author, title, personal author, and catalog or stock number.**


Reference copy only: Documents may be examined at the NHTSA Technical Reference Branch or borrowed on inter-library loan through your local library.

See publication: Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096. Order by title and SAE report number.

TRB: Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

Corporate author: Inquiries should be addressed to the organization listed in the individual citation.



ABSTRACT CITATIONS

HS-025 892

A COMPARISON OF INJURY MOTOR ACCIDENTS IN OTARA AND GLENFIELD [NEW ZEALAND]

A study was conducted of all motor vehicle accidents involving injury which occurred during 1968-1971 in two suburbs of Auckland, New Zealand (Otara and Glenfield), to compare their accident patterns with those compiled nationally for urban areas (all areas with speed limit of 50 kph or under). Data are presented on accident numbers, locations, types, time of day, and day of week. Separate consideration is given to pedestrian accidents, including the following data: accident types; age and sex of pedestrians injured; accidents to pedestrians under 10 years of age by time of day, severity of accidents, speeds of vehicles involved, locations of accidents, and distance from home for injured pedestrians; number of children per household; working mother percentages; and fencing of properties on arterial roads. The main finding is that a significantly larger proportion of pedestrian accidents occurred in Otara, a government-developed area, than in either Glenfield, a privately-developed area, or national urban areas, with the pedestrians injured in Otara significantly younger. A large percentage of child pedestrian accidents in Otara occurred on arterial roads, while a higher proportion of Glenfield accidents occurred on residential through roads. A possible deduction is that children in Otara are not as well supervised as those in Glenfield, leading to a higher proportion of child accidents. Of the supervision-related factors studied, the only substantiating one is the larger number of children per household in Otara. Planning housing areas to direct pedestrian activity away from arterial roads and providing easily-supervised play areas are suggested.

by P. R. Rippenberger; D. G. Houghton
Ministry of Transport, Road Transport Div., Private Bag,
Wellington, New Zealand
Rept. No. TRR-20; 1978; 41p 8refs
Availability: Corporate author

HS-026 042

SERVICING YOUR CAR'S ELECTRONIC IGNITION

Troubleshooting of electronic ignition systems by the home mechanic is discussed, and basic tests requiring only a volt-ohm milliammeter (VOM) and auto owner's manual are explained. If the engine will turn over but will not start, the initial check suggested is for spark at the plug. If the insertion of a key into the exposed spark plug boot brings out a spark, the electronic ignition system is probably not defective. Subsequent visual examinations include checks for loose connections, wet wires, or damaged cables. The rotor tip should be checked for cracking or burning; tension of the rotor's contact spring should also be examined. The distributor cap should also be checked for cracks, carbon tracking, center button disintegration, and spark terminal erosion. Replacement of rotor and/or distributor cap are suggested if above problems are discovered. If secondary system leads are removed during visual examination, the inside of their boots should be coated with silicone dielectric grease. If the "key test" produces no spark, the primary system must be examined. Visual inspection should be made of ignition coil for open or short circuits, cracked insulation, burned wiring, or disconnected terminal block primary connector. Most VOM tests will be performed at disconnected harness-terminal sockets or plugs, and must be made according to the car-maker's specific instructions. These tests will check the pickup coil, the electronic control module (black box), and the primary coil. Com-

plexity of tests ranges from 18 steps for Ford products to six for AMC systems. Special caution is advised due to the high voltage generated by electronic ignitions. Most tests should be performed with the ignition key off. Other manufacturer-specific cautions are offered to avoid open-circuit firing of the system, which can result in arcing within the distributor cap and/or failure of the electronic control module.

by Richard Day
Publ: Popular Mechanics v214 n5 p147-148, 150, 152, 154, 156
(May 1979)
1979; 6p
At head of title: Day on Car Care
Availability: See publication

HS-026 043

ENERGY CONSIDERATIONS IN TRANSPORTATION PLANNING

The present energy situation and projected energy scenarios are discussed in relation to their impact upon transportation planning. Overall, transportation consumes 25% of all energy, and during 1975 accounted for 52% of all petroleum consumed. Of this figure, highway transport accounted for 84% of consumption. Conservation is recognized as the most cost effective and easily implemented energy saving technology. It may, however, result in a shortfall in state gasoline tax revenues. Conservation strategies discussed with regard to passenger vehicles include car/van pooling, improved mass transit programs (spurred by reduced fares, improved service, transit system capital improvements, and auto disincentives), improved traffic flow, and adherence to the national speed limit. The need for effective passenger transportation contingency planning by all levels of government is stressed. The transportation of goods, which consumes 28% of transportation energy is also discussed. Three factors are identified which could result in energy savings in the trucking industry: capacity utilization, speed, and fleet makeup. These may be augmented by engine/drive train optimization, aerodynamic improvement, and parasitic load reduction. Fuel savings in the rail industry are also identified through reduction in circuitry; reductions in empty back-hauling, increased load per car; reduced operating speed; and changes in train configuration. Reexamination of current trailer on flat car (TOFC) practices and regulations is also suggested to optimize "piggyback" transport of goods.

by Glenn Jilek; Richard Osborne
Federal Hwy. Administration, Prog. Management Div.
1979; 37p 50refs
Availability: Corporate author

HS-026 044

TECHNOLOGY ASSESSMENT OF CHANGES IN THE FUTURE USE AND CHARACTERISTICS OF THE AUTOMOBILE TRANSPORTATION SYSTEM. [VOL. 1] SUMMARY AND FINDINGS

Congress of the United States, Office of Technology Assessment, Washington, D.C. 20510
Rept. No. OTA-T-83; 1979; 39p
For abstract see HS-026 045.
Availability: GPO, stock no. 052-003-00649-9

HS-026 045

TECHNOLOGY ASSESSMENT OF CHANGES IN THE FUTURE USE AND CHARACTERISTICS OF THE AUTOMOBILE TRANSPORTATION SYSTEM. VOLUME 2: TECHNICAL REPORT

An assessment is presented of changes in the future use and characteristics of the automobile transit system that are expected by 1985 and those that may evolve by the year 2000. Scope of assessment includes not only automobiles, but also highways, fuel supply, auto repair/service, insurance, traffic management, and law enforcement. Statistical projections from a non-policy-change baseline indicate a petroleum shortage, increased rates of highway accidents, and deteriorating air quality. Energy projections by the Workshop on Alternative Energy Strategies indicate serious to moderate petroleum shortages by the late 1980's, which may be offset by conservation and transition to alternative energy sources. Possible energy strategies include improved auto fuel economy standards, higher gasoline taxes, oil price deregulation, and gasoline rationing. The shift to alternative energy sources (alcohol, gasohol, hydrogen, electricity, and substitute liquid fuels) will not be effectively accomplished before 2000 and will require a strong program of government support and incentives. Although additional measures to control auto emissions will be required to meet urban air quality standards, further tightening of new car controls would be only marginally effective, and control of auto use appears of limited value. A nationwide program of vehicle inspection and maintenance could produce a substantial reduction in emissions. The introduction of new technology may create new environmental problems, especially in the area of diesel particulate emissions. Federal involvement in traffic safety appears necessary in the future. Greatest short-term benefits could be realized from increased use of seatbelts, enforcement of the 55 mph speed limit, and a reduction of alcohol use related to driving. Long range plans should include improved crashworthiness, improved occupant restraint systems, and improved designs to mitigate pedestrian injuries. Personal mobility is not expected to be hampered by conservation, barring a severe gasoline shortage, but urban mobility will be hampered by increased congestion during the period 1985-2000. Increased funding for conventional transit systems and special programs will greatly benefit the disadvantaged. Personal cost of auto ownership will increase, primarily due to rising fuel prices, mandated emission standards, safety features, and higher insurance costs. Capital requirements for the auto industry will increase in response to Federal regulations and changing patterns of consumer demand. Highway construction will decrease through the year 2000 and fall short of demand. Maintenance and moderate improvement of existing transit services will increase state and local costs. Major increases in Federal assistance will be needed to protect existing investments and retain current level of mobility.

Congress of the United States, Office of Technology Assessment, Washington, D.C. 20510
Rept. No. OTA-T-84; 1979; 375p refs
Summary is HS-026 044.
Availability: GPO, stock no 052-003-00650-2

HS-026 046

HIGHWAY PERFORMANCE MONITORING SYSTEM. FIELD IMPLEMENTATION MANUAL

Instructions are presented for initiating field work necessary to provide data for the Highway Performance Monitoring System (HPMS), a mechanism which, when fully implemented, should drastically curtail special national study impacts on the state

highway agencies (SHA's) by making available certain key highway elements on a continuing basis as part of normal SHA activities. The Congress frequently includes in legislation requirements for various national studies concerning existing, new, or proposed highway programs, and many of these studies require the same basic information used for biennial reports to Congress (Public Law 89-139) which are based on variety of special national studies. To avoid the necessity of performing a separate national study for each Congressional request and to provide information for day-to-day planning activities, the Federal Hwy. Administration (FHWA) has developed the HPMS for the continuous monitoring of highway performance data collection in rural, small urban, and individual urbanized areas for each of the 50 states, the District of Columbia, and Puerto Rico. The following three types of field data will be collected: section-specific data for a panel of sections, "typical" values from case studies, and areawide totals for control purposes. HPMS organization, guidance, and analyses will be the responsibility of FHWA; data preparation for HPMD will be by SHA's, together with local governmental units.

Federal Hwy. Administration, Prog. Management Div., Washington, D.C. 20590
Rept. No. OMB-004-R-2457; 1979; 148p 3refs
Availability: Corporate author

HS-026 047

AUTOMOTIVE ENGINE MODELING WITH A HYBRID RANDOM CHOICE METHOD

A numerical procedure was introduced for solving one-dimensional equations of gas dynamics for a cylindrically or spherically symmetric flow. This method has been generalized to the two dimensional equations of gas dynamics in a cylindrical geometry. This is coupled at the boundary with a grid free method (where the computational elements are segments of vortex sheets) for approximating boundary layers on a flat plate and in a cylinder. Examples are given for flow in a motored engine chamber during intake and compression strokes.

by Gary A. Sod
North Carolina State Univ., Dept. of Mathematics, Raleigh, N.C.
DOE-EY-76-C-02-3077; DOE-W-7405-Eng-48
Rept. No. SAE-790242; 1979; 17p 23refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979. Sponsored in part by the Sloan Foundation.
Availability: SAE

HS-026 048

EFFICIENCY STUDIES ABOUT DAIHATSU ENGINE/ELECTRIC HYBRID SYSTEM

A computer simulation analysis has been tried as an efficiency study of a 1.5 ton parallel configuration Daihatsu Engine/Electric Hybrid Truck, the DHS. The DHS was tested throughout four modes of operation: engine power only, engine power with recharging, engine and electric power, and electric power only. Each operating mode was then tested in accordance with each of three driving patterns: the U.S. LA-4, the Australian eight, and the Japanese ten, to simulate general, suburban, and city driving conditions, respectively. Input data were measured and/or evaluated through actual prototype testing to achieve greatest test accuracy. Simulation resulted in accurate delineation of fuel consumption in all cases.

by Shoji Honda; Chisato Hoshino; Shiro Kawakatsu; Hiromichi Tsukano; Toshikazu Yamamoto; Mikio Iida
Daihatsu Motor Co., Ltd. (Japan)
Rept. No. SAE-790013; 1979; 19p
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 049

FIAT RESEARCH CENTER HYBRID VEHICLE PROTOTYPE

A brief analysis of the Fiat Research Center's hybrid engine research program is presented. Fiat's intention in researching hybrid systems is to use batteries not as a secondary power source but as a means of storing the kinetic energy otherwise lost in braking and deceleration, and using that energy to level off the peak power requirements for running a vehicle. Since a series configuration secondary system converts thermal (primary engine) power directly to electricity, with consequent degradation of primary power, Fiat selected a parallel secondary system for prototype development. The parallel configuration, beside supplying mechanical power directly to the wheels, requires one less electrical machine (with lower nominal rating, size, and weight) than the series. In the prototype which Fiat developed, short accelerator pedal strokes activate only the thermal engine. Sustained pressure on the pedal engages the electric motor which supplies only the peak power required. When braking, the electric motor acts as a generator for recharging the batteries. This system achieves a fuel savings of 13 percent over an unassisted thermal engine. A mathematical model was also developed to simulate a sufficiently high number of drive systems (obtained by combining components) to evaluate normal fuel consumption and exhaust. A secondary purpose of the model was to calculate consumption at a constant speed and the vehicles acceleration curve. Comparison of theoretical calculations and experimental results show the model to be valid in a number of cases.

by L. Morello; R. Piccolo; L. Ippolito
Fiat Res. Center (Italy)
Rept. No. SAE-790014; 1979; 12p 7refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 050

MECHANICAL HYBRID VEHICLE SIMULATION

A method is presented for the computer simulation of hybrid (thermal/electric) vehicle component systems which can aid auto designers in selecting components, matching device capability to vehicle-road load demand, and evaluating usage strategies of engine and secondary drive systems for minimum fuel consumption at required emission levels. A power train simulation is combined with dynamic programming techniques for calibration optimization, and a sequential decision algorithm for specifying optimal operating points for both engine and secondary drive systems. An overview of road-load matching and strategy requirements is presented. The approach, developed by Ford Motor Company, serves both as a generalized computer simulation of hybrid vehicles, and as a means of specifying optimum control strategies.

by F. G. Willis; W. F. Kaufman; G. A. Kern
Ford Motor Co., Scientific Res. Lab.
Rept. No. SAE-790015; 1979; 14p 3refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 051

ENERGY AND POLLUTION VS ALTERNATIVE PISTON AND GAS TURBINE POWERPLANTS

Alternatives to the spark-ignition automotive engine are discussed according to the following evaluation criteria: emissions, fuel economy, specific power and torque, bulk, cost, and ease of manufacture. The steam engine, although moderately satisfactory in specific power and torque, is bulky. The fuel efficiency of the Rankine, or closed cycle steam engine, is inferior to that of the spark-ignition piston engine. The Stirling engine, although theoretically quiet, clean and efficient, is largely unproven regarding torque and power. Electrochemical systems are currently dependent on heavy acid-lead batteries and lack power and range. The stratified charge engine is presently operating successfully in a small passenger vehicle. Current research, however, indicates that to reach the ultimate emission standards of 0.41 hydrocarbons (HC), 3.4 carbon monoxide (CO) and 0.40 nitrogen oxides (NOx) combustion efficiency will have to be lowered too much to make the engine an attractive alternative. A similar conclusion can be reached on the unthrottled, open-chamber (Texaco) stratified charge engine. The programmed combustion stratified charge engine is octane limited. Although diesel economy is good and performance may be improved by turbocharging, powerplant cost is high. Further, a serious question exists whether diesel engines can meet NOx emission standards, even at the cost of decreased economy and increased particulate emissions. The gasoline turbine is compact, lightweight, and has the best fuel economy of any thermal engine. Its emissions are low, its performance good, and it can be manufactured by techniques known worldwide. Single, double, and triple shaft turbines are currently under development; all are regenerative (exhaust heat losses are recovered by a heat exchanger), and all employ the same basic components (compressors, turbine wheels, and heat exchangers) with equal component efficiency. The three-shaft turbine, presently under development by United Turbine AB of Sweden, requires no clutch between engine and final drive; provides the torque multiplication necessary for acceleration; and, as the vehicle accelerates, automatically reduces the torque multiplication to a 1-to-1 ratio without use of transmission controls. Only a single spark plug is required, a cooling system is unnecessary, and overall maintenance is low.

by George J. Huebner, Jr.
Environmental Res. Inst. of Michigan
Rept. No. SAE-790020; 1979; 16p
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 052

ELECTRONIC INSTRUMENTATION--LUMINOUS DISPLAYS AND THEIR DRIVE CIRCUITS

A review is provided of active work being carried out in Europe in the area of luminous dash displays, including a description of a newly developed range of integrated circuits. Test panels using Vacuum Fluorescence, DC Electroluminescence, and Light Emitting Diodes are being built into display modules

and fitted to vehicles for evaluation. The present state of development with DC Electroluminescence is described, including combined instrument panels which can be made now. The relative merits of other available systems particularly relevant to economics are compared. A range of digital clock variants, including timers, and their integration into tachometer and instrument panels leading to general digital instruments, are also described. Also covered are the special problems of trip and total odometers and the available solutions. A final area of discussion is the addition of microprocessors to the control electronics, adding the possibility of other functions such as diagnostic and message panels.

by B. Shepherd
Smiths Industries Ltd., Vehicle Instrumentation Div. (London, England)
Rept. No. SAE-790057; 1979; 10p 1ref
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 053

A NEW CONCEPT IN CHILD RESTRAINT DESIGN

An effective, low-cost child restraint device has been developed in Australia which is easily installed and removed and is compatible with all in-car restraint systems. The Safedrive Hi-Rider Child Safety Seat, developed by Cooldrive Consolidated Industries, was first marketed in 1978. This seat is designed to correspond to the anatomical differences between child and adult passengers. It particularly takes into account the child's relatively larger head mass, coupled with a weak neck, the differences in the anterior iliac region, and the narrowness of the child's buttocks. The Hi-Rider consists of a high-density foam "booster seat" with cut-out side panels through which the auto's restraint belt passes. The cut-outs not only correct the position of the belt on the child's lap (and neck in the case of shoulder restraints); they position the buckle so that inadvertent release is difficult. Since the Hi-Rider is backless, stress during a rear impact collision or the rebound phase of a front-end collision will be distributed along the length of the child's torso. Due to the side cut-outs, the lapbelt holds both the child and the seat in place during impact. Stress during an accident is applied downward, and the child is prevented from "submarining" (sliding under the lap belt). In cars which lack a permanent shoulder harness, the Hi-Rider may be supplemented by an approved child harness.

by Thomas G. Molnar; Don M. Rodwell
Repcor Ltd., Cooldrive Consolidated Industries Div., Melbourne, Australia
Rept. No. SAE-790072; 1979; 12p 7refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 054

DYNAMIC SLED TESTING OF CHILD RESTRAINTS

Seventy-seven child restraint tests were conducted at Calspan Corporation on products marketed by eleven manufacturers. Two types of three-year-old size anthropomorphic test devices (ATD's) were subjected to differing acceleration pulses upon the Calspan HYGEE acceleration sled to evaluate pulse shape upon the child restraint system. In some tests, restraint systems were intentionally installed incorrectly in an effort to ascertain the potential hazard due to improper installation. Data were collected concerning head excursion, head and chest tracheal

accelerations, Head Severity Index (HSI), and Chest Severity Index (CSI) for the ATD's. High-speed movie coverage produced dummy-kinetic results. In addition to tests with the standard trapezoidal sled pulse shapes for properly installed restraints (rear seat-lap belt and top tether attached), tests were conducted with acceleration pulses of triangular wave form, and with acceleration pulses that closely resemble the crash signatures of large and small cars. Tests were also conducted on restraints with top tethers not attached, and on front bucket seat installation of restraint seat with top tether not attached. Testing revealed that data regarding the effects of sled pulse waveforms are inconclusive due to the variability of individual child restraints and that there is a need for investigation of the effects of sled pulse waveforms with respect to acceleration (deceleration) onset, peak acceleration levels attained, velocity change, and pulse time. Dynamic performance criteria of Federal Motor Vehicle Safety Standard 213 and Canadian P.C. 1974-1013 are discussed in the light of the study's findings.

by Barbara J. Kelleher; Michael J. Walsh
Calspan Corp., Advanced Technology Center
Rept. No. SAE-790073; 1979; 23p 13refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1978. Supported in part by Consumers Union (U.S.) and Consumer and Corporate Affairs (Canada).
Availability: SAE

HS-026 055

IMPACT SLED TEST EVALUATION OF RESTRAINT SYSTEMS USED IN TRANSPORTATION OF HANDICAPPED CHILDREN

A series of 16 sled impact tests was conducted at the Hwy. Safety Res. Inst. sled facility to evaluate the effectiveness of restraint devices and systems currently being used to transport school-bus and wheelchair-seated handicapped children. A sled impact pulse of 20 mph and 16 G's was used for all tests. Eight tests involved wheelchairs in forward-facing and side-facing orientations for head-on and 33-degree oblique impacts. Another eight tests involved forward-facing bus seats for head-on and 33-degree oblique impacts. The results generally point out the ineffectiveness of many currently used devices and systems for protecting the child in a bus collision. In six of the eight bus seat tests the dummy's head struck the back of the bus seat in front. This was primarily because of a lack of upper torso restraint. A padded belt commonly used for restraining children in wheelchairs is also inadequate by itself and should only be used with additional thorax and pelvic restraint. The practice of placing wheelchairs in a side-facing orientation was found to be a poor one for the protection of the child. Wheel-lock devices proved effective in holding the wheelchairs in forward-facing tests, although chairs pitched forward 10 and 30 degrees in two tests, even with wheelchair brakes applied. In side-facing tests, these devices proved less effective. Safety belts attached to side walls proved an ineffective restraint for wheelchairs. A restraint vest proved "completely ineffective" in protecting children, placing belt load during impact directly over vulnerable abdominal organs. The Tot Guard, while not providing adequate head protection as tested, was viewed as an excellent restraint if secured by a bolt fastened to the seat structure.

by Lawrence W. Schneider; John W. Melvin; C. Ernest Cooney
University of Michigan, Hwy. Safety Res. Inst.; Wisconsin Dept. of Public Instruction, Div. for Handicapped Children
Rept. No. SAE-790074; 1979; 19p 6refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar, 1979.
Availability: SAE

HS-026 056

TRANSIENT VERSUS STEADY-STATE TIRE ROLLING LOSS TESTING

A formula is developed for computing the energy loss per unit distance (or the "rolling loss") of tires operating under transient conditions. The formula is applied to two transient test schedules - a warm-up test with constant speed and zero torque (free-rolling), and an urban driving test with rapidly varying speeds and braking/driving torques. Test results indicate that the average rolling loss during warm-up is 9%, and during urban driving, 26 to 47% higher than the steady-state rolling loss. Equipment problems associated with variant speed testing are indicated.

by Dieter J. Schuring
Firestone Tire and Rubber Co. Central Res. Labs., Akron, Ohio
Rept. No. SAE-790116; 1979; 7p 6refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 057

INTER-TEST FACILITY ROLLING RESISTANCE CORRELATION VIA CONTROL TIRE CONCEPT AND COMPUTER MULTIPLE REGRESSION MODELING

Modeling techniques for tire rolling resistance measurement are discussed. Experimental or observed rolling resistance data can be utilized to develop an empirical model that accurately depicts tire rolling resistance as a function of load and pressure over a wide range of load and pressure variations. This method allows the development of a graphical expression (carpet plot) or mathematical expression (computer modeled) to depict rolling resistance on three "control tires." When the graphical or computer modeled systems are combined with a basic control tire correlation concept, a rather accurate inter-test facility prediction system does not have to rely on the sometimes inaccurate correction equations developed from theoretical modeling techniques.

by D. E. Tillinger; J. R. Weber; R. H. Strowe
General Tire and Rubber Co.
Rept. No. SAE-790117; 1979; 6p 2refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar, 1979.
Availability: SAE

HS-026 122

BUREAU OF MOTOR CARRIER SAFETY MAJOR AND SPECIAL EMPHASIS ROADSIDE VEHICLE INSPECTIONS, AUGUST 1978--FEBRUARY 1979

Results are summarized for random-sample and selective inspections of authorized, private, and exempt/other carriers and their drivers in various parts of the U.S. which were conducted by Bureau of Motor Carrier Safety (BMCS) field personnel from Aug 1978 to Feb 1979. Inspections were performed to remove vehicles whose condition would potentially render them unsafe, to identify carriers previously unknown to BMCS personnel, and to familiarize and advise motor carriers of their responsibility under the Federal Motor Carrier Safety Regulations. Data cover vehicle systems violations for the carrier types (total number of individual violations discovered and how many resulted in vehicle being placed out-of-service), and driver viola-

tions (total and out-of-service log, medical certificate, hours-of-service, and other violations). During these checks, a total of 2558 vehicles was inspected, and 46% (1170) were placed out-of-service. The types of defects discovered among all carriers disclosed that brake violations were the most frequent type. Authorized carriers had the lowest average of violations per vehicle (2.6) among carrier types. Log discrepancies appeared more frequently than other types of driver violations. Hours-of-service violations accounted for only 12% of the total driver violations.

Bureau of Motor Carrier Safety, Washington, D.C. 20590
1979; 15p
Availability: Corporate author

HS-026 123

CAN ERGONOMICS IMPROVE PRIMARY SAFETY IN ROAD TRANSPORT SYSTEMS?

The concepts of "risk perception", "danger compensation", and "attention and effort" are examined in relation to designing road transport systems for improved safety. It is pointed out that road users continually adjust their behavior to compensate exactly for perceived risk in the traffic environment, and that drivers will trade off safety improvements for personal gains in performance (mainly increased speed). Making the driving task easier to perform may be counterproductive to road safety. With reduced arousal and effort required, a driver is less prepared to deal with sudden emergencies, and may also divert some of his attention to extraneous activities such as talking or listening to the radio. The implication is that if ergonomists are to have any impact on primary traffic safety, they must first identify practical safety innovations which do not result in such adverse effects. It is suggested that the ergonomist develop "correction factors" for danger compensation to use in conjunction with accident statistics, to predict actual gains likely to accrue from safety improvements. The practical application of ergonomics to primary safety is discussed in terms of error-preventive measures (manipulation of subjective risk perception by such means as road humps or bar patterns across road surface; and increasing perception and attention by use of "rumble strips" or advanced warning systems). In terms of error-corrective measures, it is suggested that a practical application for ergonomics research would be the testing of average drivers to obtain objective information on vehicle handling characteristics during emergency maneuvers.

by I. D. Brown
Publ: Ergonomics v22 n2 p109-16 (Feb 1979)
1979; 27refs
Availability: See publication

HS-026 124

SYSTEM FAILURES ON ROAD TRAFFIC NETWORKS: CAN ERGONOMICS HELP?

Three examples are provided, in simplified form, to illustrate how inadequate methodology in transport system design contributed to project failure, with emphasis on how an ergonomics viewpoint would have been advantageous. The first situation involves the location of highway signs. It is shown how impossible situations have been created (on certain British motorways) for motorists in terms of directional information because fundamental motorist requirements were not considered in the designing stage (use of "engineering" solutions instead). The second situation concerns the problems that result in the traffic network when a master control for traffic signals is developed using a

simplistic model of human behavior which is not reflective of real-world conditions. The last situation involves the Bay Area Rapid Transit (BART) system in the San Francisco, Calif. area. The BART project demonstrates how a simple lack of understanding of human preferences contributed to poor usage of the mass transit system.

by P. A. Lewis

Publ: Ergonomics v22 n2 p117-27 (Feb 1979)
1979; 21refs

Availability: See publication

HS-026 125

THE ROLE OF PSYCHOLOGY IN THE DESIGN AND EVALUATION OF TRANSPORT SYSTEMS

Some observations, practical and theoretical, are made on the role of psychology and the psychologist in the design and evaluation of transport systems. Effective design, it is suggested, includes not only the hardware of vehicle components, passenger terminals, and the environment in which the system is to operate, but also the practices and procedures demanded of vehicle operators and passengers. This critical review suggests that knowledge of the perceptual and motor performances of human beings and of the practical aspects of survey methodology are at a level rigorous enough to make valuable contributions in man-machine systems design and evaluation. Since the precise prediction and measurement, for example, of affective states and of information-processing and decision-making performance seem beyond the scope of current theory, the quantitative power, and hence the usefulness, of psychology to transport system designers is limited at the present time.

by I. A. R. Galer

Publ: Ergonomics v22 n2 p129-33 (Feb 1979)
1979; 7refs

Availability: See publication

HS-026 126

ERGONOMICS STANDARDS FOR ROAD VEHICLES

Work on producing ergonomics standards for road vehicles through the coordinating efforts of the International Organisation for Standardisation (ISO) is improving driver/vehicle compatibility and is influential in harmonizing the technical bases of different sets of regulations. The scope, content, and technical approaches of this ISO-coordinated research are reviewed, and the need for high standards of experimental work in the key area is underlined. Symbols have been developed to identify many car controls and displays. A major feature in their development has been the use of common experimental evaluations in different countries to assess both the initial recognition of symbols and their retention. Control identification is covered by standards for location, mode of operation, and combination of function. A sophisticated design tool has been developed to assess functional hand reach which makes allowance for the presence of the steering wheel and the effects of different driver populations. A novel feature is the introduction of a "package factor" to accommodate differences in seating characteristics. The standardization of seating reference points is unresolved; the degree of standardization which should have been achieved by use of dummies based on SAE J 826 has not been realized. Six critical dimensions in lateral spacing of pedals have been specified in an ISO standard, and an experimental technique has been developed which, it is hoped, will lead to the establishment of a design guide for pedal efforts.

by G. Simmonds

Publ: Ergonomics v22 n2 p135-44 (Feb 1979)
1979; 17refs

Availability: See publication

HS-026 127

AN ANTHROPOMETRIC SURVEY OF BRITISH DRIVERS

In order to provide details of drivers specifically related to the design of cars, 17 anthropometric measurements were taken on a sample of drivers randomly selected through a network of sites covering England, Scotland, and Wales. The numbers of drivers sampled at each site were representative of the total annual mileage recorded there by the Transport and Road Res. Lab., thus providing samples related to the numbers of drivers actually on the road. The measurements have shown that the driving population differs from U.S. driver statistics currently used in much design and legislation in the U.K. The principal source of American anthropometric data is the Dept. of Health, Education and Welfare statistics of 1960-1962. The present survey data show that British drivers of both sexes are taller than Americans of 1960. On average, both men and women in Britain are approximately 2 kg lighter than Americans of 1960, 2.5 kg lighter when taking clothing differences into consideration. It is considered that where male dimensions based on American statistics have been used in current legislation, they are adequate for the present British driving population. This is not the case for female dimensions, where the mean stature is 25 mm and the 5th percentile value 38 mm greater than the American. Dimensional models are suggested for 5th percentile female and 95th percentile male drivers, which may be used as design tools in the U.K.

by C. M. Haslegrave

Publ: Ergonomics v22 n2 p145-53 (Feb 1979)
1979; 3refs

Sponsored by Dept. of Industry, and Motor Industry Res. Assoc. (U.K.).

Availability: See publication

HS-026 128

THE EFFECT OF RUNNING LIGHTS ON VEHICLE CONSPICUITY IN DAYLIGHT AND TWILIGHT

Three field experiments were set up to investigate the conspicuity afforded approaching vehicles by running lights of different intensities under various levels of ambient daylight illumination. The main criterion of conspicuity used was the distance at which vehicles appearing in the periphery of the visual field could be detected (peripheral detection distance), a second criterion being subjectively-reported, relative conspicuity between pairs of vehicles viewed directly (subjective central conspicuity). In the first experiment, peripheral detection distances were measured in full daylight for vehicles approaching at visual angles of 30 degrees and 60 degrees and showing no lights, or pairs of 50 cd, 150 cd, low and high-beam lights. In the second experiment, subjective central conspicuity and response time were recorded for paired comparisons among six vehicles, 500 m distant, showing no lights, or pairs of low-beam lights of 50 cd or 100 cd intensity and of white or amber color. In the third experiment, peripheral detection distance was measured during the onset of twilight for vehicles approaching at a visual angle of 20 degrees, over a dry asphalt or snow-covered runway, and showing pairs of running lights of 0 cd, 100 cd, 200 cd, or 300 cd intensity. As expected, there was a strong interaction between illumination level, viewing angle, and run-

ning light intensity. The normal vehicle low beam falls within the range of intensity found acceptable for a daylight running light (300 cd to 1000 cd). Special running lights may, however, be superior, because they can be designed optimally from a functional point of view. The results have been used in a recommendation by the Nordic Traffic Safety Council in which Nordic governments are advised to make daylight running lights compulsory. Presently, daylight running lights are compulsory in Sweden and, to some extent, in Finland and Norway.

by U. Horberg; K. Rumar

Publ: Ergonomics v22 n2 p165-73 (Feb 1979)

1979; 22refs

Availability: See publication

HS-026 129

SIX AXIS VEHICLE VIBRATION AND ITS EFFECTS ON COMFORT [CAR AND MINIBUS PASSENGERS]

The vibration in vehicles (five passenger car classes and one minibus) has been measured in three translational axes and three rotational axes at the front passenger seat interface and on the floor beneath the seat. The level, frequency, and direction of vehicle vibration were found to depend upon vehicle type, vehicle speed, and road condition. Vibration associated with vehicle suspension, engine, and seat characteristics can be identified. Comparison of vehicle vibration levels obtained within each axis with discomfort levels obtained in the laboratory imply that, in the vehicles investigated, vibration in the translational axes produced greater discomfort than vibration in the rotational axes. Vertical vibration appears to produce greater discomfort than fore-and-aft, lateral, roll, pitch, or yaw vibration.

by Kenneth C. Parsons; Eleri M. Whitman; Michael J. Griffin

Publ: Ergonomics v22 n2 p211-25 (Feb 1979)

1979; 11refs

Availability: See publication

HS-026 130

IMPACT STRENGTH OF JOINTS IN SEAT BELTS

The efficiency of seat belt joints (between webbing and other components) in two commercially available (Australia) lap/sash belts was found to range from 44% to 58% under conventional static testing. Joint strength under dynamic testing was between 21% lower and 8% higher, and on average, 11% lower than that under static testing. A joint was designed which was found to have an efficiency under static testing of over 73% for each brand of webbing tested. This new design uses readily available seat belt components and a typical stitching technique and appears suitable for use as an anchorage joint. The difference between static and dynamic test results indicates that the static testing of seat belt joints is probably an unreliable and (usually) an optimistic technique. Since dynamic testing was limited in that no testing could be carried out on webbing alone, the dynamic joint efficiency could not be determined. (Joint efficiency (percent) equals breaking force of joint/breaking force of webbing x100.)

by M. Veysey; D. C. Herbert

Department of Motor Transport New South Wales, Traffic Accident Res. Unit., N.S.W., Australia

Rept. No. 4/77; 1977; 44p 8refs

Sponsored by Commonwealth Government of Australia.

Availability: Corporate author

HS-026 131

HUMAN MEASUREMENTS AND PERFORMANCE IN RETRACTING SEAT BELTS

A study of 60 male and 60 female adults in New South Wales (Australia) was conducted with a view to determining some of the chief criteria controlling the dimensional suitability of the driving position in a passenger car when a retracting lap/sash belt is worn. Data on body weight, seated height, head restraint height, seated arm reach, and the location of pelvic restraint are provided. Subjects were introduced to seat belt buckles of various designs, the unfamiliar types presenting difficulty in terms of securing and releasing. The study showed that the location of hand and foot controls should be separately adjustable. Reach data for the retracting lap/sash belt are similar to arm reach data developed by Chaffee for the lap-belt only condition (SAE-690105). Head restraints made to Australian Design Rule specifications are not high enough nor do they extend sufficiently downward; neither do these Rules specify adequately the location of the lap strap. Australians are accustomed to a certain push-button buckle in seat belts, and in view of emergency situations, should not be introduced to other buckle designs.

by David C. Herbert; Christopher W. Corben

Department of Motor Transport New South Wales, Traffic Accident Res. Unit., N.S.W., Australia

Rept. No. 5/77; 1977; 82p 19refs

Partly funded under the Transport (Res. and Planning) Act, 1970, of Australia, Project NMT-74/3.

Availability: Corporate author

HS-026 132

A PROFILE OF LONG DISTANCE TRUCK DRIVERS

In an effort to develop a profile of long-distance truck drivers, a comprehensive literature review and personal interviews of 615 heavy-vehicle drivers and 551 other motorists in New South Wales (Australia) were undertaken. Many of the ways in which the truck drivers were found to differ from other motorists may indicate simply their greater annual mileage or longer time spent by truck drivers on the road. Surveyed truck drivers had more traffic crashes, fewer holidays, longer working weeks, and longer driving intervals between rest periods. Truckers had lower educational levels than other motorists but significantly higher income levels. Vehicles driven by truck drivers were generally newer but not as acceptable. Truck drivers smoked more and showed more open anger. Lifestyles and attitudes toward other classes of road users were different for truck drivers and other motorists, especially truck driver dissatisfaction with drivers of cars hauling trailers. Owner operators vs. company drivers placed a higher value on the independence associated with truck driving. Driver fatigue was considered by all motorists as an accident factor. Contributing to truck driver fatigue are long hours, economic and other pressures, driving discomfort and some difficulty in operating vehicle, and road conditions. Over 40% of the truck drivers used stimulant drugs from seldom to more than once a day. Hallucinations were experienced by significantly more truck drivers than other motorists. There seems little doubt that many long-distance haulers experience a level of fatigue which may jeopardize their own safety and that of other road users, a problem which has no simple solution. (Appended are sample truck driver questionnaire and data analysis tables.)

by Dawn R. Linklater
Department of Motor Transport New South Wales, Traffic
Accident Res. Unit., N.S.W., Australia
Rept. No. 9/77; 1977; 124p 84refs
Partly funded under the Transport (Res. and Planning) Act,
1970, of Australia, Project NMT-74/13.
Availability: Corporate author

HS-026 133

OFF-ROAD VEHICLES ON PUBLIC LAND

Through a comprehensive literature review, the growth and environmental impact of snowmobile and off-road-vehicle (ORV) use is analyzed. Also studied are Federal and state responses to the ORV phenomenon. ORV's are defined as vehicles which are designed primarily for off-road use and whose tires or treads run on the ground (i.e. motorcycles of various sorts (minibikes, dirt bikes, enduros, motorcross bikes, etc.), four-wheel drive vehicles (Jeeps, Land Rovers, pickups), dune buggies, and all-terrain vehicles). ORV's damage natural resources (soils, vegetation, wildlife, and watersheds) and disturb picknickers and hikers who constitute the majority of outdoor recreationists. The ORV problem is seen as one of the most serious public land use problems facing the U.S. Ways must be found to accommodate these vehicles without sacrificing the integrity of the natural environment or the rights of recreationists. Federal agencies began to control ORV's on the public land seven years ago. Two major Federal land management agencies, the Bureau of Land Management and the Forest Service, are now integrating ORV use into their land use planning processes in response to two Presidential Executive Orders. The long-term environmental consequences of ORV use is better understood today than it was seven years ago, due to research by several Federal agencies, especially the Forest Service, the Geological Survey, and the Fish and Wildlife Service. Full compliance with the Executive Orders will require cooperation from the ORV industry, and the goodwill and cooperation of the ORV user organizations as well. Land management agencies responsible for areas of intensive ORV use will need to make new efforts to monitor impacts and enforce necessary restrictions. (Appended are the Executive Orders, an annotated bibliography on ORV environmental effects, full consumption figures for ORV's and snowmobiles, and a 26 May 1977 Dept. of Interior news release concerning ORV's.)

by David Sheridan
Council on Environmental Quality
1979; 92p refs
Availability: GPO, stock no. 041-011-00041-6

HS-026 134

CIVIL AND CRIMINAL LIABILITY OF ROAD COMMISSION EMPLOYEES

The potential for personal liability, civil and criminal, of road commission employees in Michigan is discussed, with special emphasis on employees, such as engineers, who exercise professional judgement in planning or designing highways or superintending road maintenance or construction. The bases for criminal and civil liability, the types of activity likely to give rise to a prosecution or lawsuit, and the likelihood of liability are discussed. Consideration is given to whether a road commission is required or permitted to provide a defense or indemnity (reimbursement) to employees who are prosecuted or sued, with attention given to the range of alternative approaches available to a road commission in defending or indemnifying its employees. A road commission employee is liable for damages if his

own personal negligence causes harm to a person or to property. The commission itself usually will be liable as well, being a codefendant and bearing the actual loss. An employee can be criminally liable for "negligent homicide" if his negligent driving causes a death. Apart from this, an employee can be criminally liable only where he is guilty of "gross negligence" which amounts to "wanton and reckless disregard" of the consequences of his actions. Criminal prosecutions of commission employees are likely to be very rare. When an employee is sued for damages because of his work for the commission, the commission is permitted but not required by statute, to provide a legal defense and to pay any damages. If criminal charges are brought, the commission may provide a defense, but may not indemnify the employee.

by Hal O. Carroll
University of Michigan, Hwy. Safety Res. Inst., Policy Analysis
Div., Ann Arbor, Mich. 48109
N-2
Rept. No. UM-HSRI-79-18; 1979; 22p 18refs
Sponsored by Oakland County (Mich.) Road Commission.
Availability: Corporate author

HS-026 135

THE EFFECT OF THE NO-FAULT AUTOMOBILE INSURANCE LAW ON ROAD COMMISSION LIABILITY FOR DEFECTIVE ROADS. SPECIAL REPORT

The conflict is examined between Michigan's no-fault automobile insurance laws and other state laws which hold a road commission potentially liable for injuries or damages sustained due to defective road surfaces. Although no court cases have yet addressed the issue, a court might decide that no-fault laws take precedence over road liability laws and therefore limit claims to those permitted under no-fault. Secondly, a court might reach the opposite conclusion: that no-fault laws do not apply when road commission failure to maintain roads is the arguable cause of injury, and that litigation must be pursued. Finally, a court might decide that both no-fault and road liability laws apply, permitting the injured party to seek compensation through both the insurer and the road commission. Possible solutions to this conflict include establishment of judicial precedence through the appellate process (i.e., decision by state court of appeals or state supreme court); legislative amendment of no-fault or road liability laws; or pursuit of a "declaratory judgment" through the courts.

by Hal O. Carroll; Dennis M. Powers
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor,
Mich. 48109
N-2
Rept. No. UM-HSRI-79-19; 1979; 17p 25refs
Prepared for the Oakland County Road Commission. See also
HS-026 136 (UM-HSRI-79-20).
Availability: Corporate author

HS-026 136

THE EFFECT OF THE NO-FAULT AUTOMOBILE INSURANCE LAW ON ROAD COMMISSION VEHICLES AND EQUIPMENT. SPECIAL REPORT

The No-Fault automobile insurance law is discussed, as are its effects on road commissions as vehicle owners and as owners of unregistered equipment and other property (with particular reference to Michigan). No-Fault changed the focus of the compensation system from the conduct of the drivers to the insur-

ance of one's own vehicle. With respect to its registered vehicles, the road commission is in the same situation as any other employer who is a fleet owner; its vehicle coverage, along with worker's compensation coverage, protects the vehicle's occupants. If unregistered road commission equipment is involved in a motor vehicle accident, the vehicle occupants are not entitled to claim against the commission for injuries unless those injuries are above the No-Fault threshold; claimants must instead look to their own No-Fault insurers. If unregistered road commission equipment is damaged in an accident with a motor vehicle, the commission is entitled to compensation under the No-Fault property damage insurance of the other vehicle. The commission is entitled to compensation under the No-Fault insurance of a motor vehicle or its driver for damage caused by that vehicle to commission property such as signs and fences.

by Hal O. Carroll; Dennis M. Powers
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor,
Mich. 48109
N-2
Rept. No. UM-HSRI-79-20; 1979; 11p refs
Prepared for the Oakland County Road Commission. See also
HS-026 135 (UM-HSRI-79-19).
Availability: Corporate author

HS-026 137

VEHICLE HANDLING STUDY: AN ASSESSMENT OF TIRE CONDITIONS. FINAL REPORT

In an investigation of 760 randomly-selected accidents occurring in Washtenaw County and part of Oakland County, Michigan, (1975-1978), data relevant to determination of the potential role of vehicle handling in accident causation, principally tire data, were collected on 1044 vehicles. Limited tire data were also obtained during random Michigan State Police checklane inspections in the summer of 1976. The checklane and accident samples were compared with respect to tire pressure, tread depth, and carcass construction. Additional comparisons were made between subsets of the accident sample. The data reveal generally poor maintenance practices in both samples, with evidence that mixed carcass construction and large inflation-pressure imbalances are overrepresented in accidents, and low tread depth is overrepresented in accidents on wet or slippery roads. These conclusions are tentative because of the limited number of vehicles in the accident sample, and because the control group may not adequately represent the population which generated the accident sample. More definitive control-group data and development of a definition of vehicle-handling accidents are recommended.

by Robert E. Scott; Charles P. Compton
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor,
Mich. 48109
MVMA-361122
Rept. No. UM-HSRI-78-62; 1978; 156p refs
Rept. for 1 Sep 1975-1 Apr 1978.
Availability: Corporate author

HS-026 138

BILLION-DOLLAR TRIAL BALLOON [AIRBAGS]

An analysis of airbag restraint effectiveness is presented in comparison with the effectiveness of active and passive belt systems. Through information compiled from public sector and private industry sources, deficiencies in airbag testing, performance, and safety claims are identified. Although airbags will provide sufficient protection to make frontal crashes survivable at speeds of 35-45 miles per hour, they will not engage at all during rear

collisions, panic stops, or side angle collisions; nor will they inflate if a car overturns or rolls. Since these types of accidents account for between 50 and 60 percent of all accidents, and since less than 10% of the occupants of the present airbag-equipped fleet use seatbelts, the overall protection offered by airbags is deemed marginal. In addition to raising vehicle costs by approximately \$325 (GM estimates for 1981), airbags will increase demand for steel by 11 million lbs., demand for energy-absorbing materials by some 130 million pounds, and demand for pyrotechnic materials by 11-12 million pounds. Moreover, the chosen pyrotechnic agent, sodium azide, is classified as a Class B poison by the Materials Transportation Bureau and has been deemed mutagenic in a variety of organisms by University of Washington researchers. No technology has been devised for the disposal of this propellant. Recommendations for actions in lieu of a mandatory airbag include implementation of a standard requiring passive belts for the driver's position in all cars; passive belts at all other positions in four passenger cars; active belts at passenger positions for bench seats in six-passenger cars; and mandatory active belts or "belt chairs" for small children. Continued research is recommended in improving lap/shoulder belts.

by John Tomerlin
Publ: Road and Track v30 n9 p146-154
1979; 28refs
Availability: See publication

HS-026 139

VOLUNTARY COMPLIANCE: EFFECTIVE PREVENTION IN HAZARDOUS MATERIALS TRANSPORTATION

A study of compliance with hazardous materials placard and shipping paper requirements by truckers on Virginia's highways was recently completed by the Transportation Safety Projects Office at Virginia Polytechnic Inst. and State Univ. (under the sponsorship of the Va. Dept. of Transportation Safety). Of 4452 trucks surveyed at 38 locations throughout the Virginia Interstate and primary highway system, 594 carried hazardous cargo; company-owned trucks were in violation of regulations to a greater extent than other types of carriers. Forty-one percent of trucks requiring hazardous materials placards were in violation of regulations; 23% of trucks with hazardous cargo on board did not carry freight bills. A strong program by safety professionals is recommended to increase voluntary compliance with Federal regulations for highway transportation of hazardous materials.

by D. L. Price; J. W. Schmidt
Publ: Professional Safety v24 n5 p18-21 (May 1979)
1979; refs
Availability: See publication

HS-026 140

COPING WITH THE NATION'S HIGH-RISK CARGO. PERSPECTIVES ON HAZARDOUS MATERIALS INCIDENTS

An overview is provided of the hazardous materials accident problem, and the training program available from the National Fire Protection Assoc. (NFPA) on handling hazardous materials emergencies is described. Last year in the U.S. there were an estimated 16,000 hazardous materials incidents. Major contributors to such accidents are human error, environmental conditions, container flaws, and equipment failures. Representative incidents have involved flammable and combustible liquids,

flammable solids, explosives, poisons, reactives, and unstable chemicals. Gasoline, liquid petroleum gas, and anhydrous ammonia are increasingly involved. Estimates are that 10% of all interstate trucks and one rail car in 23 carry hazardous cargo. For firefighters and other emergency service personnel, training and preplanning provide the only advantage in confronting hazardous materials incidents. Most fire service training programs include courses on the problems of dealing with hazardous materials, but such courses do not address all relevant groups nor the scope of the problems encountered. The NFPA has developed an extensive training program and packaged courses in "Handling Hazardous Materials Transportation Emergencies" under the sponsorship of the Dept. of Transportation. Ten seminars, each conducted for three days in key U.S. cities, train instructors, who in turn take packaged courses back to their own areas to train more personnel to deliver the course to vital audiences. The performance-oriented instruction stresses knowledge, training and planning, and addresses the need for making improved initial responses and fast, informed decisions, followed by taking swift, trained action. The program presents a "how to" for a community-based plan of action that involves all persons and groups having vested responsibility for community protection.

by Austin R. Sennett

Publ: Professional Safety v24 n5 p27-9 (May 1979)

1979

Availability: See publication

HS-026 141

LIQUID-TRANSPORTATION TECHNOLOGY

Movement of liquid industrial products and raw materials from source to destination presents a major management challenge. Every liquid has its own unique combination of chemical, physical, and physiological properties which call for a broad range of expertly designed controls to ensure safety, timing, and economy in liquid-transportation logistics. Each transportation mode (pipeline, water, rail, highway, and air) has special characteristics, capabilities, and limitations; each mode must be considered individually and in combination (intermodal shipping). Distribution costs (for freight, material, operations, maintenance, regulatory compliance, and inventory) constitute a major component of the final product price tag. Capital investment in facilities and transportation equipment can be high. Federal, state, and municipal governments, port authorities, and several associations and intergovernmental bodies regulate transportation directly. Many regulations designed for control of chemicals, and for health and environmental protection, have major implications for the chemical shipper. Among the pertinent questions for the industrial liquid shipper are those of reactivity (with the container), corrosion, health hazards, transportation environment (temperature, pressure), transportation side effects (container cleaning), liquid containment, materials handling (packaging, palleting, loading and bracing), transportation equipment (tanks), product stewardship, and emergency response.

by Leon R. Kiley; Harry Scheffer

Publ: Professional Safety v24 n5 p38-44 (May 1979)

1979; 1ref

Reprinted from Chemical Engineering (3 Apr 1978).

Availability: See publication

HS-026 142

DEADLY CARGO [TRANSPORTATION OF HAZARDOUS MATERIALS]

Various fatal accidents involving hazardous materials are cited in the U.S. in recent years, and actions being taken to prevent such incidents are outlined. Train, truck, ship, and plane accidents involving hazardous cargo (e.g. toxic chemicals, radioactive materials, flammable liquids) reached a total of nearly 16,000 (mostly minor) in 1977. One contributing cause is the rapid increase in the number of hazardous products (1600). To step up roadbed and track maintenance (half of derailments in 1978 related to poor roadbeds), the Federal government will spend \$150 to \$200 billion over the next ten years. The Dept. of Transportation (DOT) has banned transport of hazardous materials in freight cars with high-carbon wheels (prone to rupture) after 30 Jun 1979. DOT has set up new safety regulations for tank cars (front and rear shields, special couplers, thermal insulation). Their timetable for implementation was advanced after a challenge by the National Transportation Safety Board (NTSB), Selma, Ala. banned hazardous rail cargo from a switching yard until tracks were repaired. One truck in ten is estimated to be carrying hazardous cargo, and more than 1420 accidents occurred in 1976 involving such cargo. Hazardous cargo in trucks became a public issue in New York City when it was revealed that radioactive plutonium from a nuclear facility was being trucked through the city streets. Another concern to safety experts is the trucking of liquified petroleum gas. Part of the overall hazard problem is the transport of highly volatile cargoes by ships; oil spills present another kind of problem. Action by the Air Line Pilots Assoc. has resulted in various restrictions regarding the air transport of hazardous materials (including their ban on passenger aircraft, except for critical pharmaceuticals). The insurance industry, National Fire Protection Assoc., Manufacturing Chemists Assoc., and American Trucking Associations are likewise involved in programs for safe transport of hazardous cargo. The NTSB has made recommendations for materials transport, but many of them, especially those concerning rail transport, have never been implemented.

by Al Frantz

Publ: Professional Safety v24 n5 p45-8 (May 1979)

1979

Reprinted from Journal of Insurance (Jul-Aug 1978).

Availability: See publication

HS-026 143

PRODUCT OPPORTUNITIES OF URETHANE CROSSLINKING

The problems involved in the development of a technologically viable urethane system, and the chemical approaches to their solution are discussed. The outstanding reversion and aging resistance obtained from a novel vulcanization system are reviewed, and provide the basis for a more extensive discussion of the physical properties of urethane in relation to some product applications. The performance of all-urethane vulcanization systems in tires, bushes and mounts, LCM CV extrusion (continuous vulcanization by extrusion into a liquid curing medium), and low-hardness Sanforizer belts is discussed and illustrated in terms of principal property requirements.

by P. J. Corish; M. C. Kirkham

Publ: NR Technology v10 Pt1 p1-8 (1979)

1979; 4refs

Based on lecture presented at symposium on urethane crosslinking, MRPRA, Brickendonbury, England, Nov 1978.

Availability: See publication

HS-026 144

**ROAD SCHOOL (64TH) ANNUAL PROCEEDINGS,
HELD AT INDIANA CONVENTION EXPOSITION
CENTER, INDIANAPOLIS, INDIANA, APRIL 18
AND 19, 1978**

Nine papers are presented, related to U.S. highway finances. President D. J. Hanson, Jr. of the American Road and Transportation Builders Assoc. discusses transportation financial needs during the next decade, emphasizing the need to increase Federal funding for all transportation construction programs now. Congressman D. L. Cornwall (a member of the House Public Works and Transportation Com.) explains the committee's efforts to provide effective, workable highway and public transit legislation. The present and future of the Federal-aid highway program are considered by H. A. L. Lindberg, of the Federal Hwy. Administration (FHWA). Federal aid for 3R (resurfacing, restoration, and rehabilitation) highway projects, and the development of a geometric design guide for 3R projects developed by the American Assoc. of State Hwy. and Transportation Officials are discussed by M. D. Graham, of the New York State Dept. of Transportation. R. R. Jarboe, Jr., of the Army Corps of Engineers, discusses value engineering (i.e. functional analysis) in highway construction; this methodology is defined as an organized effort directed at analyzing functions for determining the lowest total cost of effective ownership. L. W. Thomas, counsel for the Transportation Res. Board, highlights a few of the major principles applicable to suits against state or public officials for negligence or defects in the design, construction, or maintenance of highways. R. L. Groves, of Management and Transportation Assoc., Inc., discusses the design, development, and implementation of the Construction Supervision Manpower Planning System for the Indiana State Hwy. Commission. Chairman J. A. Gardner of the Indiana State Hwy. Commission briefly describes the financial status of the state highway program and W. Bond of the Asphalt Inst. describes some basic characteristics of various asphalt materials and seal coating operations.

by D. G. Shurig, ed.
Publ: Engineering Bulletin of Purdue University
Rept. No. Eng-Extension-Ser-149; 1978; 88p refs
Availability: See publication

HS-026 145

**SMALLER CARS AND SAFETY: THE EFFECT OF
DOWNSIZING ON CRASH FATALITIES IN 1995**

By applying crash/injury findings from Hwy. Safety Res. Inst. (Univ. of Michigan) in-depth data files to police-reported Texas accident data for 1975-1976, and by using 1995 driver and vehicle population projections, estimates are made of the effect of downsizing on crash fatalities in 1995. The 43,300 fatalities hypothesized for the 1995 passenger car fleet in the U.S. are 5.6% more than the 41,000 hypothesized for a 1995 fleet of cars of sizes and weights in the 1975 Texas mix. Passive restraint systems and other improvements in vehicle design can be expected to reduce the 1995 annual fatalities by about 40% (down to 26,000). On the other hand, increased annual mileage per passenger car in 1995 could contribute significantly to an increase in fatalities. It has been estimated that the 1995 figure will be 18.4% higher than the 9635 annual mileage/car during 1975. To the extent that figure is higher in 1995, accident exposure and therefore accidents and fatalities will be increased, canceling some of the positive effects expected because of roadway improvements, full implementation of passive restraints, and improved vehicle crashworthiness.

by Howard M. Bunch
Publ: HSRI Research Review v9 n3 p1-5 (Nov-Dec 1978)
1978; 4refs
Adapted from paper presented at Symposium on Technology, Government, and the Future of the Automobile Industry, Harvard Business School, Cambridge, Mass., Oct 1978.
Availability: See publication

HS-026 146

**CHILD RESTRAINT SYSTEMS AND PUBLIC
POLICY**

Questions posed in an interview with John W. Melvin of the Hwy. Safety Res. Inst. deal with the effectiveness of the present Federal Motor Vehicle Safety Standard 213 relating to child restraint systems; key factors in the design of a child restraint; provisions in a vehicle for attachment of child restraints; frequency of use of child restraints; parents' failure to protect their children with child restraints; public education programs on child restraint use; mandatory child restraint use legislation; and studies of crashes to compare unrestrained vs. restrained child occupants. Dr. Melvin stated that of all automotive crash occupants under age ten in a study of 348 crashes (involving 494 children in this age group), less than 5% were restrained by either a child restraint seat or an adult lap belt. He points out, moreover, that many child and infant restraints are being used improperly. It is expected that a 1980 revision of FMVSS 213 will improve the crashworthiness of new restraints, but will likely do little to increase the low rate of usage. State laws mandating restraint of child occupants and development of easy-to-use child restraints are deemed necessary.

by John W. Melvin
Publ: HSRI Research Review v9 n3 p6-11 (Nov-Dec 1978)
1978
Availability: See publication

HS-026 147

**SAFETY EFFECTIVENESS EVALUATION OF THE
NATIONAL ACCIDENT SAMPLING SYSTEM. PT. 2**

This evaluation is a supplement to an original evaluation of the National Hwy. Traffic Safety Administration's (NHTSA) National Accident Sampling System (NASS). The evaluation was made to determine if a sufficient amount of reliable data would be collected under the system to determine accurately accident trends and to assess the impact of vehicle safety standards. The first evaluation (NTSB-SEE-78-1, adopted by the National Transportation Safety Board on 2 Mar 1978) included the following recommendations to NHTSA and to the Federal Hwy. Administration (FHWA) to improve the utility of the NASS effort. It was recommended to establish a NASS Advisory Com. to provide NHTSA with a broader perspective of types of data to be collected and data storage and retrieval methods; to study the practical problems associated with collecting key data before selecting the number and location of future NASS investigation sites; to study the potential cost and data quality effects from liability litigation between parties to individual motor accidents which could involve NASS testimony; to assure no expansion of original ten NASS sites until after field data collection/processing; to ensure team accident reports/case files are systematically filed at a central location for easy retrieval; to revise currently proposed data collection forms to include increased emphasis on the highway environment. (These first six recommendations are applicable to NHTSA.) It was recommended that the FHWA conduct a comprehensive study to identify highway safety accident problem factors for which

data must be collected, as well as supporting research and countermeasure formulation. The present evaluation concludes that encouraging progress has been made by NHTSA, that NASS can support data needs of both NHTSA and FHWA, that NASS planning has improved substantially, and that of the original recommendations, the Advisory Com. item is "closed, with acceptable action", while the other six are "open, with acceptable action." NASS can now be expanded to 20 sites.

National Transportation Safety Board, Office of the Managing Director, Washington, D.C. 20594
Rept. No. NTSB-SEE-79-1; 1979; 18p refs
See also HS-023 352.
Availability: NTIS

HS-026 148

TRAFFIC SPEED REPORT NO. 107. INTERIM REPORT, OCTOBER - DECEMBER 1978 [INDIANA HIGHWAYS]

In a continuing study of vehicle speeds on Indiana highways, spot-speed observations were made between Oct and Dec 1978 of free-flowing automobiles and trucks on Interstate, four-lane, and two-lane highways throughout the state during daylight and under favorable conditions. Analysis of the speed data (which are tabulated) showed that the overall average speed for all vehicles was 58.3 mph. The overall average speeds for passenger cars and all trucks were 58.8 mph and 57.7 mph, respectively. These overall average speeds were 1.2 mph greater for passenger cars and 0.9 mph greater for trucks than speeds found in the Jul-Sep 1978 study period. The average speed of passenger cars was 0.5 mph less and that of heavy trucks was 0.4 mph less than the respective average speeds of a year earlier.

by James R. Mekemson; G. K. Stafford
Purdue Univ., Joint Hwy. Res. Proj., West Lafayette, Ind. 47907
HPR-1(16)
Rept. No. JHRP-79-2; 1979; 48p
Conducted in cooperation with Federal Hwy. Administration and Indiana State Hwy. Commission. Planning study title: "Speed Trends for Indiana Highways."
Availability: NTIS

HS-026 149

EYE MOVEMENTS BEHAVIOR WHILE DRIVING A CAR: A REVIEW. PROGRESS REPORT NO. 1

A review is presented of empirical investigations concerning automobile drivers' "eye movements behavior" during driving on straight roads, on curves, through traffic, and along familiar driving routes. Consideration is given to the general assumptions underlying the analysis of eye movements behavior, pointing to the conditions under which the investigation of the car driver's rational information input is reasonable, if the experimenter is to use the eye movements technique. Eye movements behavior is used to refer mainly to the fixations and the saccadic movements of the eye. Human factors such as experience, physical condition, blood alcohol concentration, fatigue and sleep deprivation, and carbon monoxide exposure are considered, along with vehicle characteristics (windshield wipers, rearview mirror, speedometer). The role of peripheral vision in information acquisition is treated. From the empirical results analyzed, it is suggested that even though the fixations and the movements of the eye represent only an auxiliary criteria for information input, they do refer to central processing mechanisms. For example, if the central processing mechanism is inhibited (e.g. by alcohol, fatigue), then it is reflected immediately in the peripher-

al visual search strategy. The eyes, presumably, follow only the requirements of the brain for adequate information input in relationship with environmental conditions. Therefore, in order to study central processing mechanisms, it is important to know more about the phenomenal meaning of every single fixation.

by Amos S. Cohen
Swiss Federal Inst. of Tech. Zurich, Dept. of Behavioral Science, Zurich, Switzerland
DAERO-78-G-018
Rept. No. ARI-TR-78-TH4; AD-A061271; 1978; 59p 55refs
Research monitored by Army Res. Inst.'s Scientific Coordination Office, Europe.
Availability: Defense Documentation Center, Cameron Station, Alexandria, Va. 22314

HS-026 150

PROPOSED NATIONAL STANDARDIZATION, REPLACEMENT VEHICLE IDENTIFICATION NUMBER SYSTEM

A national standard is proposed for the purpose of assuring that all motor vehicles subject to title and/or registration are readily identifiable through the verification of a manufacturer's vehicle identification number (VIN) or state-issued replacement or assigned identification number. Under the proposed national replacement VIN standard, a replacement VIN numbering system shall be administered by the state agency responsible for titling and registering vehicles, and the operational functions shall be carried out by this registration agency and/or a statewide law enforcement agency. The replacement program shall provide for the inspection of rebuilt salvage and specially-constructed vehicles, all vehicles and identifiable components with missing or altered identification numbers, and those vehicles where discrepancies are noted between the VIN recorded on title or other ownership documents and the public VIN on the vehicle.

Vehicle Equipment Safety Commission, Replacement VIN Com.
1979; 11p
Availability: Corporate author

HS-026 151

PROPOSED NATIONAL STANDARDIZATION, MOTOR VEHICLE SUN SCREENING DEVICES

A national standard is proposed for sun-screening devices used in passenger cars, multipurpose passenger vehicles, trucks, and buses with a gross vehicle weight of 10,000 lb or less. The purpose of the regulation is to establish minimum light transmittance and maximum reflectivity requirements for vehicle glazing materials and/or products designed to be used in conjunction with vehicle glazing materials for reducing the effects of the sun. The regulation is intended for operational and traffic safety and for providing a guide to state administrators for uniformly regulating screening devices for all locations within the applicable vehicles (windshields, front side windows, side wings, side windows behind driver, rear windows). A jurisdiction may grant exemptions from the requirements or require use of other equipment/devices based on geographic location needs.

Vehicle Equipment Safety Commission, Sun Screening Com.
1979; 5p
Availability: Corporate author

HS-026 152

ENFORCEMENT REQUIREMENTS FOR HIGH-OCCUPANCY VEHICLE FACILITIES. FINAL REPORT

Findings are presented of a research study which reviewed existing high-occupancy vehicle (HOV) enforcement practices and problems, the identification of effective, innovative HOV enforcement techniques, the HOV legal environment, and development of model legislation. The following 16 projects in the U.S., encompassing each type of freeway and arterial treatment, were visited to gain in-depth operational and enforcement data on each project: Shirley Highway, Fairfax County, Va.; San Bernardino Freeway, Los Angeles, Calif.; I-95, Miami, Fla.; Route 101, Marin County, Calif.; Banfield Freeway, Portland, Oreg.; Ramp Metering Bypass Ramps, Los Angeles; North Central Expressway, Dallas, Tex.; I-35, Minneapolis, Minn.; San Francisco-Oakland Bay Bridge Toll Plaza, Oakland, Calif.; Nicollet Mall, Minneapolis; U.S. 1/South Dixie Highway, Miami, Fla.; Washington, D.C. central business district streets; Elm/Commerce Streets, Dallas; N.W. 7th Ave., Miami; Marquette/Second Avenues, Minneapolis; and Ponce de Leon/Fernandez Juncos Avenues, San Juan, Puerto Rico. These projects exhibited varying enforcement programs, deficiencies, and performance levels. Enforcement guidelines have been prepared for each type of freeway and arterial priority treatment of HOV's. In order to improve HOV enforcement, innovative techniques (involving photographic instrumentation, mailing of citations, tandem (team) patrol, and paraprofessional officers) have been identified within the context of the research. A legal review was conducted of the following issues posed by these techniques: admissibility of photographic evidence, instrument certification requirements, visibility of occupants, mailing of citation to vehicle owner, nonwitnessing officer issuing the citation, and allocation of powers to the enforcement agency. Model legislation is drafted to provide the proper legal environment for effective HOV enforcement.

by N. Craig Miller; Robert B. Deuser
Beiswenger, Hoch and Associates, Inc., P.O. Box 600028, North Miami Beach, Fla. 33160
DOT-FH-11-9240
Rept. No. FHWA-RD-79-15; 1978; 241p refs
Rept. for Feb 1977-Dec 1978.
Availability: NTIS

HS-026 153

AUTOMOBILE FUEL EFFICIENCY SEMINAR, MAY 11, 1978, WASHINGTON, D.C. VOL. 1. SUMMARY OF PROCEEDINGS

by S. William Gouse; Marion W. Meader, ed.
MITRE Corp., Metrek Div., McLean, Va.
Rept. No. M78-96-Vol-1; 1978; 23p
For abstract see HS-026 154, vol. 2, Proceedings; individual presentations are HS-026 155-HS-026 161.
Availability: Corporate author

HS-026 154

AUTOMOBILE FUEL EFFICIENCY SEMINAR, MAY 11, 1978, WASHINGTON, D.C. VOL. 2. PROCEEDINGS

A compilation is provided of seven presentations at a seminar sponsored by MITRE Corp. in cooperation with the Dept. of Energy, concerning the goal of maximum effective use of fuel in

the transportation sector vs legislated goals of environment, health, safety, serviceability, and fuel economy. Focus was placed on conflicting goals before the motor vehicle industry and on the nature of solutions evolving to meet these requirements. The following topics were covered: engine readiness and its effect on vehicle fuel economy; impact of automotive technological developments on future fuels quality; fuel economy, automobile emission standards, and air quality; outlook for fuel economy improvements; importance of synfuels characteristics to engines; gasoline blends and other alternative fuels; and public interest in auto fuel efficiency. Seminar background, agenda, introductory remarks, and overall findings are included.

by Marion W. Meader, ed.
MITRE Corp., Metrek Div., McLean, Va.
Rept. No. M78-96-Vol-2; 1978; 128p 2refs
Includes HS-026 155-HS-026 161. Includes questions and comments from seminar participants. Vol. 1, Summary of Proceedings, is HS-026 153.
Availability: Corporate author

HS-026 155

ENGINE READINESS AND ITS EFFECT ON VEHICLE FUEL ECONOMY

The importance is addressed of considering and quantifying powertrain or engine readiness requirements in current and proposed vehicles in order to maximize fuel consumption while maintaining driver acceptance. Engine readiness is defined as the promptness of an engine's response with a higher power output when the need for increased power is signaled by the vehicle operator. The energy expended to maintain engine readiness is therefore the additional fuel energy used to keep the engine operating at a condition of acceptably high readiness, over that expended to meet the power requirement at the lowest energy usage. Energy losses in an automotive engine are discussed, demonstrating the large energy expenditure to engine friction at high speed and light load. Brake-specific fuel consumption as a function of engine speed and load is considered. Various approaches to matching the power developed by the engine with the power required by the vehicle are discussed. Ways to maintain a base low-power condition are examined in terms of energy loss and response time to increase power; they include spark retard, spark deactivation, intake throttling, exhaust throttling, mixture-ratio control, small engine with intake pressure near barometric pressure, low engine speed, and engine stopping. Hybrid powerplants, which provide rapid response from very efficient standby energy sources, are discussed as an alternative, including their present technical limitations.

by Wayne M. Brehob
Ford Motor Co., Emissions Control Analysis and Planning
Publ: HS-026 154 (M78-96-Vol-2), "Automobile Fuel Efficiency Seminar. Vol. 2. Proceedings," McLean, Va., 1978 p5-19
1978; 1ref
Seminar held in Washington, D.C., 11 May 1978.
Availability: In HS-026 154

HS-026 156

THE IMPACT OF AUTOMOTIVE TECHNOLOGICAL DEVELOPMENTS ON FUTURE FUELS QUALITY

Following an overview of the relationship between automotive technology developments and fuel quality (with a review of trends in the past decade and projections for the 1980's), the relationship between engine performance and octane quality, and energy requirements during refining vs. octane quality, are

used to examine the use of electronic controls for optimum energy matching of fuel and engine. The electronic engine knock sensor/limiter is used as an example to illustrate the interactions among fuel octane requirement, driver perception of noise, and acceleration performance. The tradeoffs among compression ratio, knock control, and octane requirements are examined. It is stated that such sophisticated controls as the knock controller have the potential to achieve better vehicle efficiency by providing new ways to optimize the many variables; it is emphasized that controller logic design will be a key element in the success or failure of such approaches, and that fuel octane, as in the past, will continue to be of prime importance. Gains in vehicle efficiency obtained by increasing compression ratios, which require higher octane fuel, must be debited with the additional energy required to produce this extra octane.

by Richard R. Cecil
Exxon Res. and Engineering Co., Fuels Res. Lab.
Publ: HS-026 154 (M78-96-Vol-2), "Automobile Fuel Efficiency Seminar. Vol. 2. Proceedings," McLean, Va., 1978 p21-35
1978
Seminar held in Washington, D.C., 11 May 1978.
Availability: In HS-026 154

HS-026 157

FUEL ECONOMY, AUTOMOBILE EMISSION STANDARDS AND AIR QUALITY

The crude oil situation worldwide is reviewed, especially with regard to gasoline use; the relationship between automotive emission standards and fuel economy is explored; and the relationship between air quality and automotive emission standards is considered. The factors of vehicle weight, production vs. Environmental Protection Agency certification vehicle performance, refinery penalty, and octane quality are examined in order to establish a relationship between emission standards and fuel consumption. It is demonstrated that an energy penalty of about 6.5% is incurred due to the use of lower octane unleaded rather than higher octane leaded fuel in the U.S. Fuel consumption increases of up to 5% apparently have been incurred to meet the U.S. 1973-78 emission standards, compared to a very small increase to meet current, less stringent Canadian standards. With regard to air quality and emission standards, it is shown that compared to other sources of hydrocarbons and nitrogen oxides, motor vehicle controls beyond the present will have small effect on total air quality, and that current carbon monoxide standards already allow air quality requirements to be met even under conditions of saturated traffic in urban areas.

by Alden J. Pahnke
E. I. Du Pont de Nemours and Co., Inc., Res. and Devel.
Publ: HS-026 154 (M78-96-Vol-2), "Automobile Fuel Efficiency Seminar. Vol. 2. Proceedings," McLean, Va., 1978 p37-57
1978
Seminar held in Washington, D.C., 11 May 1978.
Availability: In HS-026 154

HS-026 158

THE OUTLOOK FOR FUEL ECONOMY IMPROVEMENTS

Fuel economy requirements for cars and light trucks under existing laws and regulations and some of their effects on fuel consumer costs are reviewed, followed by a look at approaches to increasing passenger car fuel economy after 1985. Between 1974 and 1978, the industry-wide average fuel economy increased by about 40%. The 1978 model year standard is 19 mpg, with 20 mpg and 27.5 mpg for 1979 and 1985 model years,

respectively. Compared to a situation where the standards were held at 20 mpg after 1980, fuel savings of about 10 billion gallons in 1985 are projected with the present standards. It has been estimated that the purchaser of a typical 1984 car would save about \$1000 over the life of the car, vs. a typical 1977 model year car purchaser. Projected fuel savings (because of fuel economy standards) for light trucks sold in model years 1980 and 1981 are 8 billion gallons over their lifetimes compared with 1979 models. Life-cycle savings of about \$550 are projected for 1981 models vs. 1974 models. Technology improvements by the auto industry to meet fuel economy standards have included weight reduction, transmission improvements, relative engine-size reduction, and improvements in lubricants, accessories, aerodynamic drag, and rolling resistance. Three possible major approaches for improving passenger car fuel economy after 1985 are reduction in average inertia weights, more extensive use of lightweight diesel engines, and shifting the mix of models offered. The National Hwy. Traffic Safety Administration has not extended standards after 1985, but it is possible that fleet average standards could be in the 36- to 44- mpg range by the early 1990's.

by Richard L. Strombotne
National Hwy. Traffic Safety Administration, Office of
Automotive Fuel Economy Standards, Washington, D.C. 20590
Publ: HS-026 154 (M78-96-Vol-2), "Automobile Fuel Efficiency Seminar. Vol. 2. Proceedings," McLean, Va., 1978 p59-65
1978
Seminar held in Washington, D.C., 11 May 1978.
Availability: In HS-026 154

HS-026 159

SYNFUELS CHARACTERISTICS: IMPORTANCE TO ENGINES

Synfuels derived from coal and oil shale are discussed, from their source materials, through conversion and refining, to engine use. The chemical compositions of oil shale, coal, petroleum, and gasoline are compared. Coal liquefaction methods include pyrolysis, solvent extraction, catalytic hydroliquefaction, and indirect gasification, followed by liquid synthesis (Fischer-Tropsch). A brief rundown is given of coal liquefaction pilot plants which are or will be operating in the U.S. In situ and above-ground processing of oil shale is mentioned briefly. The boiling range and character of gasoline, diesel, and jet fuels are outlined. The chemical composition of the liquid produced directly by the char oil energy development process is compared with its composition after severe hydrogenation. The products from the H-coal process (direct catalytic hydrogenation), the Fischer-Tropsch SASOL-type process, and the Mobil Process are shown. The question is which fuel should be manufactured, given the constraints of raw material, and of economic and energy costs of transforming the raw materials into a finished product. A discussion of synthetic gasoline characteristics relative to engine use points out the advantage of the synfuels' high octane because of higher aromatic content. This higher aromaticity is a disadvantage in diesel and jet fuels and must be taken care of in refining. From an economics standpoint, imported crude's production cost is given as \$15 a barrel, vs. \$20 for shale oil and \$30 for coal liquids. As an addendum, the merit of the hydrogen fuel cell for the long term is mentioned.

by G. Alexander Mills
Department of Energy, Fossil Energy Prog.
Publ: HS-026 154 (M78-96-Vol-2), "Automobile Fuel Efficiency Seminar. Vol. 2. Proceedings," McLean, Va., 1978 p67-83
1978
Seminar held in Washington, D.C., 11 May 1978.
Availability: In HS-026 154

HS-026 160

GASOLINE BLENDS AND OTHER ALTERNATIVE FUELS

The use of alcohols (methanol and ethanol) is discussed, straight or in a blend with gasoline. If alcohol is used straight, the fuel management system must be modified to provide a greater fuel flow and to operate in a desirable air-to-fuel regime. The materials in the fuel supply system, at least, and possibly in the engine system must be changed. It is highly desirable to increase the compression ratio to give the added power and efficiency which is permitted by the higher octane in the alcohols. For alcohol-gasoline blends, present engine designs are suitable in principle. Because alcohol burns cooler, lower combustion (and therefore less lost heat) and less nitrogen oxides emissions result. The problems with alcohol use, such as phase separation with water present, lower energy density, cold start, vapor lock, air-fuel mixture control, and gasket swelling, can be overcome. In terms of economics, methanol is about twice as costly as gasoline on an equivalent energy basis, and ethanol is about four times as costly. Although ethanol would probably play a localized or a regional role in future fuel supply, methanol could have a sizeable impact on a national level, assuming problems with its use (such as hydrocarbon emission) are overcome. If methanol plants from nonpetroleum resources were to be built, they would represent a low-risk investment compared to other alternative fuels. There are multiple applications for methanol (vehicle, gas turbines for electrical peaking power, fixed burners, industrial alcohols), and it can presumably be blended just as readily with a synfuel as with petroleum.

by E. Eugene Ecklund

Department of Energy, Alternative Fuels Utilization Branch
Publ: HS-026 154 (M78-96-Vol-2), "Automobile Fuel Efficiency Seminar. Vol. 2. Proceedings," McLean, Va., 1978 p85-101
1978

Seminar held in Washington, D.C., 11 May 1978.

Availability: In HS-026 154

HS-026 161

THE PUBLIC INTEREST IN AUTO FUEL EFFICIENCY

The impacts of automotive fuel economy on three areas of public interest (life-cycle cost, national security, and conservation of exhaustible resources) are discussed. Using a typical mileage history over the ten-year lifetime of a car, a cost-benefit analysis is made of various fuel-economy improvement approaches. From a consumer point of view, any capital item, such as a diesel engine, whose cost is less than the present value of the fuel saved over the lifetime of the car, is an appropriate purchase. With regard to downsizing, as automobiles become more efficient due to four-speed transmission, lockup clutches, improved aerodynamics, radial tires, etc., the fuel economy saving that can be expected per pound decreases (especially for lower hp/inertia weight ratios). If the downsizing simply involves the removal of nonfunctional excess weight, this is beneficial to the consumer; if materials substitution is utilized, the cost-benefit ratio is dependent on the cost of the lighter material. There is a safety implication to downsizing; risk is an inverse function of car weight. Despite the risk increase, downsizing is considered cost-beneficial, especially when accomplished by a change in car mix. Allowing for both safety and fuel benefits, the 55 mph speed limit is not considered cost-effective in terms of time value. Accordingly, investments in citizens band radio and radar detectors on the part of truckers are deemed economic. Oxidant control, to the extent legislated, is seen to be against the public interest. In terms of national security, petroleum

storage as insurance is seen useful, as well as active development of coal-to-methanol-to-gasoline plants and pursuance of battery/electric car developments. Dependence on Organization of Petroleum Exporting Countries (OPEC) is expected to decrease. It is seen in the public interest to use the least expensive energy resources first, then turn to other resources.

by Lawrence Goldmuntz

Economics and Science Planning

Publ: HS-026 154 (M78-96-Vol-2), "Automobile Fuel Efficiency Seminar. Vol. 2. Proceedings," McLean, Va., 1978 p103-19
1978; 1ref

Seminar held in Washington, D.C., 11 May 1978.

Availability: In HS-026 154

HS-026 162

TRAFFIC ACCIDENT INJURIES: A SURVEY OF THE INJURED DRIVER, FRONT-SEATING PASSENGER AND MOTORCYCLISTS

In order to ascertain the pattern of injuries sustained in traffic accidents, a study was made of 415 drivers and 268 front-seat passengers of cars and light vans/pickups and 2665 motorcyclists and pillion riders who were treated in the emergency units of six government hospitals in Singapore from 18 Aug to 31 Dec 1977. The injury patterns observed are reflective of the nonbelted occupant. For drivers and front-seat passengers, a relatively high number received head, trunk, and upper limb injuries, even in low-speed impacts. There was a significantly higher incidence of chest injuries for drivers vs. passengers due mainly to impact with the steering column. Although crash helmet use is mandatory in Singapore, the number of motorcyclists with open wounds to the head was substantial, possibly related to improper wearing of helmets or to different protection offered by various helmet designs. Motorcyclists were more vulnerable to leg injuries than car occupants. In terms of fractures to the lower limbs, the tibia and fibula were most vulnerable, with the lower part of the leg having more open wounds and bruises. The vulnerable age group is the male driver (car and motorcycle) in his 20's. Recommendations for car drivers and passengers include seat belt use; driving tests to ensure awareness of human/environmental factors related to accident risk, adequate vehicle control, and knowledge of traffic regulations; driving test for requalification of drivers with licenses suspended for more than a year; continuing road safety education campaign; proper car maintenance; and use of defensive driving techniques. Recommendations for motorcyclists include recognition that cyclists are 6 times more likely to suffer injuries than car occupants, proper wearing of suitable crash helmets, wearing of appropriate protective clothing and footwear, increased conspicuity (e.g. fluorescent clothing, headlights at all times), proper cycle maintenance, same driving tests as for drivers, and defensive driving.

by Chao Tzee Cheng; Fam Kim Loy

MH-95:01/8-30

Publ: Journal of Traffic Medicine [Sweden] v7 n1 p8-13 (Mar 1979)
1979; 10refs

Sponsored by Ministry of Health, Singapore.

Availability: See publication

HS-026 163

IMPROVING PROSPECTS FOR PEDESTRIAN SAFETY

In carrying out their joint responsibility for administering Federal programs for pedestrian safety, the National Hwy. Traffic

Safety Administration (NHTSA), and Federal Hwy. Administration (FHWA) seek to assist states, local government, researchers, and citizen groups in generating increased activity and commitment toward reducing the nation's pedestrian accident toll. These programs involve analysis of data on pedestrian accidents to identify typical accident components and to design and test countermeasures, development of program guidelines for state and local administration of pedestrian safety projects, development of user manuals and training courses for pedestrian and bicyclist safety, and funding of pedestrian safety engineering projects as integral elements of Federal-aid highway construction and traffic engineering programs. Factors leading to pedestrian accidents have been identified as those applicable to drivers, vehicles, the environment, and pedestrians themselves. Of the 30 categories of urban pedestrian accidents isolated by NHTSA, the following types account for about 60% of all urban pedestrian accidents: dartout (33%), intersection dash (8%), vehicle turn/merge-with attention conflict (6%), multiple threat (3%), bus-stop related (3%), vendor/ice cream truck (2%), and backing up (2%). Five of the most promising countermeasures for reducing these accidents are pedestrian midblock crossing barriers, midblock crosswalks, diagonal on-street parking, stop-line relocation, and far-side bus stop. Also important for safety and mobility is the provision of curb ramps for the elderly and handicapped, and for sidewalks as an integral part of an adequate highway system. Redesign of vehicle front ends has been found to lessen the severity of common pedestrian injuries.

by David I. Davis; Lawrence A. Pavlinski
National Hwy. Traffic Safety Administration, Washington, D.C. 20590
Publ: Journal of Traffic Medicine [Sweden] v7 n1 p14-8 (Mar 1979)
1979; 8refs
Reprinted from Traffic Quarterly (Jul 1978).
Availability: See publication

HS-026 164

DUAL FUEL TEST [NATURAL GAS/GASOLINE ENGINE SYSTEMS]

The state of the art for using natural gas in cars and trucks is a dual-fuel system which allows the use of either gas or gasoline by a simple dash-mounted control that changes from one fuel mode to another while the vehicle is running. To determine the difference in performance and fuel mileage between gasoline and natural gas (methane) in a stock passenger sedan, a Dual Fuel System (Dual Fuel Systems, Inc., Montebello, Calif.) was installed on a 1979 Chevrolet Malibu with a 305 cu-in-displacement, V-8 engine and automatic transmission. The comparison test included a series of acceleration runs and a 73-mi fuel economy test loop. Running on gasoline, loop fuel consumption was 4.2 gal, for an average of 17.38 mpg, at a cost of \$3.10. For the natural gas, the result was 13.3 mpg but at a total fuel cost of \$1.38. Retail installation cost for the dual system runs about \$1200, refueling stations with compressors, storage tanks, and metering valves are necessary, and there are a host of safety codes. Comparative acceleration tests from 0 mph to 50 mph required 10.2 sec for methane and 8.8 sec for gasoline, with the gap widening a bit as speeds increased. Natural gas conversions are made on stock engines which do not have the compression ratios or ignition timing to extract the most energy from the gas; because of current emission controls, this is also true for gasoline. Natural gas is usually plentiful and comparatively cheap, but its use in motor vehicles is economical only for large fleets. (Amortization of initial investment for a 28-vehicle fleet is less than 2.5 yr.)

by Chuck Nerpel
Publ: Motor Trend v31 n5 p90, 92-3 (May 1979)
1979
Availability: See publication

HS-026 165

DIESEL MYSTERY CLEARED UP. THE ADVENTURE OF THE 22 TO 1 COMPRESSION RATIO

Diesel engines differ from gasoline engines mainly in that they do not have spark plugs or a carburetor. Instead of using a spark to ignite the fuel-air mixture provided by the carburetor, diesels inject fuel into the engine, where compression causes the fuel to explode. Diesel engines have a compression ratio (CR) of about 22 to 1, vs. an average of 8 to 1 for a gasoline engine, the rapid-fire explosions resulting in the diesel's unique "clicking" sound. The higher CR requires a stronger and heavier engine block; the average U.S. diesel car weighs 500 lb more than its gasoline counterpart and costs perhaps \$750 more. A major diesel advantage is its 20% to 25% better fuel economy, at a cost of a 10% to 20% decrease in power. Longer warm-up time for the diesel is being reduced to a few seconds with glow plugs in newer engines. The future of the diesel is uncertain because of recently proposed strict new emission standards for 1983 (0.2 g/mi particulate vs. 1981 figure of 0.6 g/mi), which the automakers say they cannot meet and are seeking to have changed.

Publ: Driver v12 n11 p10-1 (Apr 1979)
1979
Availability: See publication

HS-026 166

COOPERATIVE CONSERVATION. THE HOWS AND WHYS OF THE CAR POOL

The benefits of carpooling include less congestion and fewer accidents on the highways, less energy consumption and reduced pollution, and personal benefits to the driver: more relaxed commuting (fewer driving hours), reserved parking for carpool vehicles, and the most convincing benefit of cost savings. Savings to the carpooler include less money spent on gas, tires, maintenance, parking fees, tolls, etc. Carpools can be set up informally, with a few friends, or an employer can try to publicize pools and convince employees of the benefits of ridesharing. For example, the California Dept. of Transportation, local city governments, and a nonprofit group called "Commuter Computer" have started a ridesharing program called "Come Together". With the cooperation of businesses, industries, and government agencies, these groups survey employees to determine the numbers interested in setting up carpools or van pools, or in using mass transit to get to work. Some suggestions to promote efficient and pleasant carpools include the following: agree on some ground rules of behavior before the pool begins; have a definite schedule for when each person drives; set up a chain of communication in case of emergencies; make an agreement beforehand on payment schedule of driving expenses; make sure each car is clean and in good repair; check out necessary insurance coverage for carpool beforehand; stick to a schedule of passenger pickup; do not make side trips; expect changes in the pool; and drive safely. Cooperation among carpool members is a key ingredient to success.

Publ: Driver v12 n11 p22-7 (Apr 1979)
1979; 1ref
Availability: See publication

HS-026 167

THE PROVISION OF TRANSPORT FOR THE HANDICAPPED

A review of some literature pertaining to the problems of, and the provision of transport for, individuals with mobility handicaps reveals that much has been done to meet the transportation needs of these individuals but that much more remains to be accomplished. Even the basic question of whether to provide fully-accessible transport for the handicapped person, or to construct special systems designed to meet his mobility needs, remains unresolved in most countries. A review of alternative methods for meeting these needs (walking, conventional or specialized public transport, taxis, school buses/postal delivery vans, personal transport, privately-owned systems) suggests that in certain modes, particularly walking, the designer could substantially improve the mobility of the disabled person. By contrast, the design of specialized systems may not be cost-effective, partly because the physically disabled do not constitute a uniform user group. In the past, activist groups and disabled-persons organizations have opposed special systems on the basis that in times of financial pressure, these systems are most likely to suffer budget cuts. The greatest difficulty is seen to rest with the expensive modification of existing transport systems. Progress in the field is expected to vary among countries and to be slow, but continuous, largely in response to pressure from activist groups.

by N. J. Ashford

Publ: Ergonomics v22 n2 p189-97 (Feb 1979)

1979; 24refs

Availability: See publication

HS-026 168

AUDISAFE: A GENERAL ACCIDENT-PREVENTIVE DEVICE

AUDISAFE is an accident-preventive system which allows a driver to perceive the nature, the intentions, the distance, the relative speed, and the direction of motion of potential impending hazards in one, simple, unambiguous signal. It is particularly useful under low-visibility conditions. AUDISAFE is a part psychoacoustic and part radio-electronic system which employs three interrelated and ultimately reductionist measures to relieve the perceptual burden associated with unclear and rapidly-changing displays of physical information. The operator is an integral part of the mechanism; characteristics of the auditory perceptual system are used to translate a fundamentally-coded display. The system eliminates culturally-contrived informational interfaces (e.g. words and numbers in a conventional alphanumeric display). Essential information is coded in terms of a strict and simple correlation between physical features of the salient environmental stimuli and natural auditory depth cues (rather than translating the environmental features into a symbolic visual pattern requiring detranslation). The system is designed to be of use in the following 15 common accident-contributory situations: passing, lane changing, leaving a parking space or concealed entrance to join a moving traffic stream, entering/leaving a highway, turning at junctions, reversing, concentrated queueing of vehicles, multiple collisions in fog and blizzard, acute bends, acute vertical curves, pedestrians crossing, road-rail grade crossings, miscellaneous hazards outside driver's main line of sight, speeding under unsuitable road conditions, and poor traffic control conditions. Other potential applications exist in traffic control and areas outside the field of road transport.

by D. Connolley

Publ: Ergonomics v22 n2 p199-210 (Feb 1979)

1979; 37refs

Availability: See publication

HS-026 169

A DESIGN LAYOUT METHOD FOR RELATING SEATING TO THE OCCUPANT AND VEHICLE

A systematic layout method is described which is intended to define the seating package and body reference points in vehicle design, as well as to determine the adjustment envelope required to fit a given range of population sizes. The operational requirements of the vehicle are considered, including the number of occupants and their function. Consideration is given to seat access and the application of restraint systems. Vehicle speed and type of maneuverability envisaged will have an effect on the seat's body construction and suspension; these factors are considered and balanced against a suitable posture for the occupants. Consideration is given to the determination of a specification which should enable the designer to work out the function of seating, seat adjustments, and restraint anchorage points in a methodical manner. The design layout method takes into account the vehicle control pedals, fascia, steering wheel and its range of adjustment where applicable, windshield, roof lining, rear bulkhead, rear passengers, gear lever, and all other possible intrusions into the driver's work space.

by F. W. Babbs

Publ: Ergonomics v22 n2 p227-34 (Feb 1979)

1979; 2refs

Availability: See publication

HS-026 170

TRANSPORT ERGONOMICS AND DESIGN EDUCATION

Activities of the Industrial Design/Transport Dept. at Lanchester Polytechnic, Coventry, England are described, where the emphasis is placed on user requirements in the design process. The following specific design projects are described to illustrate the consideration given to human needs and the use of ergonomics data and techniques: competition-winning design for a dinghy which can be used as an emergency life raft; adaptation of a standard front-wheel-drive car with a transverse-slide seat to allow easy access for a wheelchair user; design for a bus seat which can be used either as a conventional seat or as a standee "lean" seat; design of a vehicle for use by spina bifida children; design for a pedal-driven power unit for transport and machine uses in developing countries; and design of adult tricycles for the transport of mothers plus children under 5 years of age. It is suggested that greater collaboration between industrial designers and ergonomists would be possible if the latter published their data in a more accessible form, and that designers must place greater emphasis on the product evaluation aspect of their work.

by Michael Tovey

Publ: Ergonomics v22 n2 p235-43 (Feb 1979)

1979

Availability: See publication

HS-026 171

ROAD-TESTING CARS

The conduct of the British magazine "Motor" weekly road tests is described. The tests assess the performance, handling, comfort, and practicality of a car in a correct state of assembly, tune, and adjustment. Reliability and durability are covered by long term tests, not included here. A car is usually assigned for two weeks to one particular road tester who becomes responsible for carrying out the performance testing at the Motor Industry Res. Assoc.'s test facility near Nuneaton, England, and for writing the test report. The same car is driven by at least four, often six, other road testers or staff members with long experience of car evaluation. The top speed, acceleration, fuel consumption, and braking performance are measured objectively using various instruments, a fifth wheel with chart recorder being the most important. Since no simple and inexpensive objective handling tests have so far been found acceptable, handling is judged subjectively. Similarly, it is difficult to measure "ride" objectively, although the use of a sound-level meter for interior noise levels is being considered. Other tasks are to weigh, photograph, and draw the car. There is generally close agreement among the road-test staff about the virtues and vices of any given car, though the emphasis to be placed upon them is sometimes the subject of debate.

by C. A. Curtis
 Publ: Ergonomics v22 n2 p245-52 (Feb 1979)
 1979
 Availability: See publication

HS-026 172

HUMAN FACTORS ASSESSMENT OF VEHICLE POWER STEERING

Subjective assessments were made of the power steering of an in-service vehicle used by the military as part of an investigation following adverse reports on the vehicle's handling. The effects of three different power steering settings were appraised by driving the vehicles on a road-test track and cross-country. Two questionnaires obtained the drivers' overall views and comments on specific factors. Analysis of variance showed that the subjectively-assessed differences among the three power steering settings were statistically significant at the 2% level. The six civilian and six military drivers' views were congruent and course differences did not consistently and significantly affect the overall assessment. The drivers' stated preferences among the vehicles supported the variance analysis results. Incidents observed during the trials showed that drivers could lose control of the vehicle because of excessive speed and/or faulty driving techniques, independently of power-steering characteristics. This suggests that many incidents could be prevented by giving specific instructional guidelines to drivers during training and by incorporating a speed-limiting device in any modifications to the special-purpose vehicle.

by G. J. Gillies
 Publ: Ergonomics v22 n2 p253-62 (Feb 1979)
 1979; 15refs
 Availability: See publication

HS-026 173

BUCKLE UP, DUMMY [SEAT BELTS]

Two recently published studies sponsored by the National Hwy. Traffic Safety Administration report the low percentage of American drivers who use seat belts and the low comfort/

convenience rating given various seat belts systems by Michigan drivers. The first study, conducted by Opinion Res. Corp., found that in a sample of 70,000 drivers in 19 metropolitan areas, only 14% of drivers were using seat belt systems, with only 8.9% using all of the protection provided by the manufacturer. Another finding was that smaller cars had a higher percentage of seat belt usage, illustrating the belief that smaller cars are less safe in crashes and that passengers in large cars do not need protective devices. The second study, conducted by Veri-Res. Corp., asked a group of 114 drivers in the Detroit area to evaluate seat belt systems on 19 domestic and 11 foreign cars. Almost all were 1978 models and were representative of about 80% of the expected sales volume for 1979. Test subjects found the seat belt systems, (in descending order of incidence) uncomfortable during upper torso movement, too tight, poorly fitting and difficult to latch. Other problems reported were twisting shoulder belts, too much slack in automatic tension relief systems, and failure to retract after unbuckling. The "best" car in terms of restraint system had a reported rate of problems 35% of the time, the "worst" having them 85% of the time.

by Jim McCraw
 Publ: Motor Trend v31 n5 p7 (May 1979)
 1979
 At head of title: Editor's Report.
 Availability: See publication

HS-026 174

KINETIC MODULUS OF STEEL: A NEW AUTOMOTIVE DESIGN PARAMETER

Successful automotive weight reduction with high strength-tensile weight ratio steels has resulted in a reevaluation of basic structural design parameters. A new concept, Kinetic Modulus, describes the nature of materials in motion. Kinetic modulus is influenced by stress and strain amplitude, yield strength, and the number of loading cycles. The scope of kinetic modulus encompasses elastic, secant, dynamic, and tangent moduli, each of which is a specific case of kinetic modulus at a particular condition. Theoretical and experimental results are presented to support the concept; they show that high-strength steel has high dynamic stiffness and improved vibration response in structures than that of lower-strength steel. Thus, higher-strength steel ("stiff steel") can be used advantageously in stiffness-controlled automotive structures to achieve greater weight reductions.

by A. S. Kasper; W. E. Swenson; S. Dinda; F-L. Cheng
 Chrysler Corp., Materials Engineering
 Rept. No. SAE-790003; 1979; 18p 19refs
 Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1978.
 Availability: SAE

HS-026 175

FROM PEDESTRIAN REFLECTORIZATION TO USE OF TRAFFIC RULES, FROM TYRE [TIRE] TESTING TO CRASH TRACKS AND DRIVING SIMULATORS

Some general background is provided on the National Swedish Road and Traffic Res. Inst. (VTI) in Linköping, Sweden, with a description of the activities of one of its three research divisions, the Road User and Vehicle Div. VTI was formed in 1971 by broadening the scope of the Swedish Road Res. Inst. from pure technical road and vehicle research to include more traffic studies and behavioral research. The Institute presents the results of research and development work relating to roads, road traffic, and road safety to three groups of users: government agencies

who require data for traffic policy formulation; administrative authority boards (e.g., National Road Administration); and contractors, transportation organizations, manufacturers, and others concerned with human and technical matters in road transportation and construction. The Road User and Vehicle Div. consists of eight coordinating research groups which cover road user/environment interaction, road user performance characteristics, road user influence, road user/vehicle interaction, biomechanics, functioning vehicle systems, functioning vehicle components, and vehicle/environment interaction. The basic research philosophy is that road traffic is a man-machine system with man as the limiting link. Highway safety is improved by selection of drivers, by education and training, and by changing the highway environment (rules, roads, signs and signals). Research projects in progress are listed.

by Kare Rumar
Publ: Zeitschrift fur Verkehrssicherheit v25 n1 p3-6 (1st Q 1979)
1979
Availability: See publication

HS-026 176

AN INVESTIGATION INTO THE LEVEL OF PROTECTION AFFORDED TO FULLY RESTRAINED PASSENGER VEHICLE OCCUPANTS

Preliminary findings of an ongoing study by Transport Canada to assess the level of protection currently afforded to fully-restrained passenger vehicle occupants involve a sample of 94 occupants who sustained injuries of AIS (Abbreviated Injury Scale) 2 or greater. Interior compartment intrusion, seat-back loading by unrestrained back-seat passengers, and contact with interior surfaces are found to cause most of the injuries. The head/skull and face were found to be the most vulnerable to injury, with the most common contacts being the steering assembly, the side interior, and the roof. The chest was the second most frequently injured body region, with the belt being the cause in approximately 42% of the cases, all being in the AIS 2 or 3 severity level. The second most common source of chest injury was found to be the intruding side interior. Interior compartment intrusion probably contributed to the severity of injuries sustained by close to 28% of the occupants and was the major cause of injury at the higher AIS levels. Partial ejection can occur even when an occupant is fully restrained, with generally serious results. A high incidence of improper usage of belts that had separate assemblies was noted. Interesting, also, was the high incidence of chest injuries among elderly females. Today in Canada, approximately 80% of the driving population reside in one of the four provinces which have enacted mandatory seat belt use legislation. There is therefore an increasing need for crash data with which to identify potential improvements to the restraint system and to other aspects of vehicle crashworthiness.

by D. J. Dalmotas; P. M. Keyl
Publ: American Association for Automotive Medicine
Quarterly/Journal v1 n2 p26-30 (Apr 1979)
1979; 9refs
Availability: See publication

HS-026 177

JOAN CLAYBROOK. THE WOMAN BEHIND THOSE NHTSA [NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION] REGULATIONS

A personal interview with National Hwy. Traffic Safety Administrator Joan Claybrook by Bob Mallon then president of the

National Automobile Dealers Assoc., is excerpted and paraphrased. Ms. Claybrook sees the regulatory process as a question of whether a safety regulation is reasonable, not whether that type of regulation should exist at all, and states that the auto industry, not NHTSA, implements safety and performance standards in its design selection. The NHTSA administrator insists that many of the products mandated by the safety standards would not be removed by manufacturers if the regulations no longer existed. Claybrook says her testimony before Congress on auto repair malpractices was intended to identify and correct a consumer problem, not to critique the auto repair industry. Accidental deployment of air bags is not seen as a product liability concern for dealers, and the use of lap/shoulder belts in combination with air bags for best overall protection is emphasized. In terms of public acceptance, Claybrook feels that enactment of a mandatory seat belt law requires a simultaneous public education program on the value of belts. Presumed profitability by operators is seen as a contributing factor to failure of diagnostic inspection centers. In terms of announcing recalls, NHTSA feels it has to tell the public when a decision has been made, and most often has no control over the publicity surrounding an issue. Ms. Claybrook feels that dealers can contribute to NHTSA's activities by communicating problems to the agency, and by serving the public through information programs and assistance in the shop.

by Ron Rogers
Publ: Cars and Trucks v51 n3 p28-31, 40-4 (Apr 1979)
1979
Availability: See publication

HS-026 178

SURFACE VEHICLE SOUND MEASUREMENT PROCEDURES. HANDBOOK SUPPLEMENT. 1979 ED.

The rationale behind the modification to SAE (Society of Automotive Engineers) Recommended Practice J184, Qualifying a Sound Data Acquisition System, is explained in detail, in recognition of the need to meet existing standards. Focus is placed on the rapid changes in measurement equipment, and an explanation is given of the procedure required to verify performance. In addition to complete systems, the requirements for individual instruments and circuit components are discussed. SAE Recommended Practices for sound (or performance) measurements of surface vehicles (and components) are provided, including motorcycles, passenger cars, light trucks, heavy trucks, buses, snowmobiles, motorboats, construction machinery, earth-moving machinery, small-engine-powered equipment, agricultural equipment, truck tires, vehicle traffic horns, forward warning horns for construction equipment, and electrically-operated backup alarm devices. The modified SAE J184 is included. Some procedures are new, technically revised, or editorially changed. An SAE Information Report provides definitions of acoustical terms relating to sound-insulation materials.

Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, Pa. 15096
Rept. No. SAE-HS-184; 1979; 81p refs
Availability: SAE

HS-026 179

THE HUMAN NECK--ANATOMY, INJURY MECHANISMS AND BIOMECHANICS

Eight papers cover the following topics dealing with human neck structure and injury: anatomy of the cervical spine and

associated structures, cervical fractures and fracture dislocations, cervical fractures and fracture dislocations sustained without head impact, anatomy and trauma of the cervical spinal cord, X-ray analysis of the neck during voluntary motion, soft tissue injuries of the neck, neck injury tolerance, and biomechanical analysis of swimming pool neck injuries. A short bibliography of suggested readings is included.

Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096
Rept. No. SAE-SP-438; 1979; 54p refs
Includes HS-026 180--HS-026 187. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 181

CERVICAL FRACTURES AND FRACTURE DISLOCATIONS--AN OVERVIEW

The various types of neck fractures and fracture dislocations are described (including illustrations, and photographs of X-rays), with emphasis on the mechanisms of flexion, extension, lateral bending, and rotation, and on potential neurological damage. The most common fracture or fracture dislocation of the neck is of the flexion type, frequently associated with compressive forces along the vertical axis of the front of the cervical vertebrae. If the head is forcibly moved rearward beyond its anatomical range of motion, then cervical extension injuries can occur. In lateral bending, the compression forces tend to jam together the articular facets of one side. Rotation injuries result from twisting forces on the neck. High cervical fractures are usually unaccompanied by significant neurological deficit in survivors but are often the cause of sudden death.

by D. F. Huelke; E. A. Moffatt; R. A. Mendelsohn; J. W. Melvin
University of Michigan Medical School; Prince Georges General Hosp.; University of Michigan, Hwy. Safety Res. Inst.
Publ: HS-026 179 (SAE-SP-438), "The Human Neck--Anatomy, Injury Mechanisms and Biomechanics," Warrendale, Pa., 1979 p9-15
Rept. No. SAE-790131; 1979; 1ref
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: In HS-026 179

HS-026 182

CERVICAL FRACTURES AND FRACTURE-DISLOCATIONS SUSTAINED WITHOUT HEAD IMPACT

A literature review is presented of clinical reports and experimental studies (using animals, cadavers, and volunteer subjects) of cervical injuries produced without impact to the head; also reported are three case histories of such injuries from the Univ. of Michigan's Hwy. Safety Res. Inst. accident data file, as well as unpublished cases of such injuries which have been observed by neurosurgeons in the U.S. and Canada. The interactions of the flexible linkages of the spinal elements of the neck and the loads applied to the neck by the dynamics of the vehicle and occupant can produce neck injuries without head impact. Although some cervical injuries reported were sustained by wearers of lap and shoulder belts in auto accidents, it is not considered that belt use is a potential hazard because ample evidence has accrued in the medical and engineering literature to document general injury and fatality reduction by use of seat belts. It is believed that in many instances, occupants would be more seriously injured or killed were belts not worn.

by D. F. Huelke; R. A. Mendelsohn; John D. States; J. W. Melvin
University of Michigan Medical School; Prince Georges General Hosp.; University of Rochester School of Medicine and Rochester General Hosp.; University of Michigan, Hwy. Safety Res. Inst.
Publ: HS-026 179 (SAE-SP-438), "The Human Neck--Anatomy, Injury Mechanisms and Biomechanics," Warrendale, Pa., 1979 p17-23
Rept. No. SAE-790132; 1979; 83refs
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979. Reprinted from Journal of Trauma v18 n7 (Jul 1978).
Availability: In HS-026 179

HS-026 183

ANATOMY AND TRAUMA OF THE CERVICAL SPINAL CORD

The gross external and internal structures and blood supply of the cervical portion of the spinal cord are described and illustrated. Knowledge of the anatomy of the cervical cord is prerequisite to properly localizing, diagnosing, and prognosticating on the effects of trauma to this part of the body. The spinal cord can be abused by breaking its bony cover, tearing other supportive structures, and interrupting the blood supply. The four mechanisms of damage to the cervical cord, and resulting traumatic syndromes are discussed. Concussion implies a blow with forces transmitted to the cervical cord in the absence of other causative factors. Compression of the cord can occur when there is obvious bony disruption as with fractures or fracture dislocations; it also may occur in less obvious situations. Vascular compromise often occurs as a manifestation of the compression mechanism in conjunction with direct pressure on the cervical cord; the same compressive force on the cord interrupts blood flow through one or more arteries. Tension damage to the cord most often results in fatalities; this type of trauma usually is associated with high-speed collisions in which the trunk is relatively fixed and the head attempts to become separated from it. Traumatic syndromes include anterior cord syndrome (paralysis with loss of pain and temperature senses), posterior cord syndrome (a rare case, manifested by loss of functions served by posterior columns, chief manifestation being ataxia), Brown-Sequard syndrome (one-sided paralysis and loss of position, vibratory, pain, and temperature senses, and sweating), and acute central cord syndrome (weakness in the upper extremities which is apt to be profound).

by R. A. Mendelsohn
Prince Georges General Hosp.
Publ: HS-026 179 (SAE-SP-438), "The Human Neck--Anatomy, Injury Mechanisms and Biomechanics," Warrendale, Pa., 1979 p25-9
Rept. No. SAE-790133; 1979; 8refs
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: In HS-026 179

HS-026 184

X-RAY STUDY OF THE HUMAN NECK DURING VOLUNTARY MOTION

Radiographs were taken of the cervical spines of male subjects during voluntary motion from full flexion to full extension. Using a radiographic technique intended for the study of injected contrast media flow, X-rays of cervical motion were taken at a frequency of six/sec for a period of 3 1/2 sec. The resulting radiograph sequences clearly demonstrate the position of the skull and all cervical vertebrae at approximately 16 intervals.

The frequency and clarity of this type of X-ray have not been observed previously in the literature. The position of each vertebra relative to the immediately inferior one was plotted for each of the 16 sequential X-rays. The results of the study offer a description of the plane motion of the cervical spine in terms of each vertebra relative to the next inferior vertebra, including the range of this motion for each vertebral joint and the sequence of the motion of each vertebra relative to all the others. A simple pinned-link model offers a reasonable representation of the motion in this study, with possible application to construction of anthropomorphic dummies for automobile crash testing.

by E. A. Moffatt; Arthur M. Schulz

Riddell, Inc.

Publ: HS-026 179 (SAE-SP-438), "The Human Neck--Anatomy, Injury Mechanisms and Biomechanics," Warrendale, Pa., 1979 p31-6

Rept. No. SAE-790134; 1979; 7refs

Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.

Availability: In HS-026 179

HS-026 185

SOFT TISSUE INJURIES OF THE NECK

The literature and the author's own medical experience are reviewed with respect to whiplash, and injuries of the larynx, trachea, and esophagus. Whiplash is a poorly defined term including ligamentous and muscle strains, hematomas, disc injuries, and less frequently, brain, eye, and ear injuries. Diagnosis is difficult because clinical signs and X-ray, electromyography, and electroencephalography findings are few. Protection and rest will cure most patients within a year, but approximately 2/5 of patients have permanent symptoms and disability. Rear-end impact accidents cause the head and neck to hyperextend over the seat back, and 38% of occupants so exposed will experience whiplash. Head rests give protection, but differential rebound may occur, producing injurious hyperextension and whiplash. Anchoring the pelvis by lap belt use, thus preventing rebound, increases the risk of whiplash unless a head restraint is available and properly positioned. Shoulder harnesses appear to have no effect on whiplash injury in rear-end impact accidents. Women are more predisposed to whiplash injury than men. Vehicle factors related to whiplash injury include seat-back deflection and crushability of rear end. The larynx, trachea, and esophagus, in front of the spine, are injured by impact against the dash or steering wheel. Airway obstruction may occur and cause death if not restored quickly. Permanent disability can occur because of scarring and partial airway or esophageal obstruction or vocal cord damage. Combination shoulder and lap belts appear to be the most effective means of protecting the anterior structures of the neck.

by John D. States

University of Rochester School of Medicine; Rochester General Hosp.

Publ: HS-026 179 (SAE-SP-438), "The Human Neck--Anatomy, Injury Mechanisms and Biomechanics," Warrendale, Pa., 1979 p37-43

Rept. No. SAE-790135; 1979; 27refs

Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.

Availability: In HS-026 179

HS-026 186

HUMAN NECK INJURY TOLERANCE

Very little quantitative information exists on the tolerance of the human neck to external loads, partly due to the complicated

mechanical structures that comprise the neck. As a result of the complex structural interactions which can occur among neck components, it is necessary to specify the forces and moments acting on the neck as quantities which are related to injury, rather than deal with stresses and strains in the damaged tissues. Biomechanical tolerance has been determined for the most vulnerable anterior neck structures, the laryngeal cartilages. Isolated larynges have been found to fracture at 40 lb to 50 lb (178N to 244N) when statically and dynamically loaded, with the ring-like cricoid cartilage fracturing at a lower force level. The mean load for imminent structural collapse of the larynx has been found to be 100 lb (490N). No data are available on force levels to produce laryngeal edema, nor tolerance data on hyoid bone, trachea, or soft tissues of the neck, skin, blood vessels, and nerves, and the thyroid gland. There have been very few studies to determine forces necessary to damage the cervical spine due to direct or indirect loading to the neck or head. In one study of dynamic superior-inferior impacts to cadavers, it was found that fractures of the cervical vertebrae of normal subjects began to occur for peak forces over 1280 lb (5.7kN), peak impactor velocities over 24.6 ft/sec (7.5 m/sec), and initial impact pulse work values of 280 ft lb (380 J). In the only study to date to suggest tolerance values for indirect loading conditions, tolerance levels (lower limits) for the bending moment in flexion were found to be 140 ft lb (190 N.m) and in extension, 42 ft lb (57 N.m).

by J. W. Melvin

University of Michigan, Hwy. Safety Res. Inst.

Publ: HS-026 179 (SAE-SP-438), "The Human Neck--Anatomy, Injury Mechanisms and Biomechanics," Warrendale, Pa., 1979 p45-6

Rept. No. SAE-790136; 1979; 4refs

Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.

Availability: In HS-026 179

HS-026 187

BIOMECHANICAL ANALYSIS OF SWIMMING POOL NECK INJURIES

An analysis of 67 neck injuries incurred in diving and sliding accidents in swimming pools provided the Consumer Product Safety Commission with appropriate accident data to develop swimming pool equipment safety standards, to develop methods to measure and predict the trajectory and velocity of people engaged in swimming pool activities, and to learn more about neck tolerance and neck injury mechanisms. A mathematical model was developed for predicting subject pre-injury trajectory and velocity. A real-life simulation was made of nine accidents. The simulation involved test subjects of similar physical build to the accident victims who then performed the maneuvers leading to the injury, but in deeper water. High-speed movies were taken, above and below the water, to measure the motion. A frame-by-frame analysis provided data to determine the trajectory and velocity profiles of the test subject. The maneuvers included diving from the pool edge, diving from various board types, and sliding down various slide configurations. A potential injury mechanism was demonstrated due to a snap roll resulting from dropping the head and/or hands, causing a sudden increase in drag. The majority of the neck injuries were of the flexion-compression type resulting in fractures through the vertebral body and an anterior dislocation. Results indicate that tolerable velocities for neck loading in flexion-compression with the torso free and following are less than 311 cm/sec (10.2 ft/sec).

by James McElhaney; Richard G. Snyder; John D. States; M. Alexander Gabrielsen
 Duke Univ., Dept. of Biomedical Engineering; University of Michigan, Hwy. Safety Res. Inst.; University of Rochester School of Medicine and Rochester General Hosp.; Nova Univ.
 Publ: HS-026 179 (SAE-SP-438), "The Human Neck-Anatomy, Injury Mechanisms and Biomechanics," Warrendale, Pa., 1979 p47-53
 Rept. No. SAE-790137; 1979; 16refs
 Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
 Availability: In HS-026 179

HS-026 188

DECORATIVE ELECTROPLATED PLASTICS: A REVIEW

Properly applied electroplated plastics produce light-weight, complex, low-cost, durable automotive components with a lustrous chromium finish that adds to the marketability of the automobile; the variables which influence the durability of these plated plastics are reviewed. Three basic property categories for plastic resins (coefficient of thermal expansion, tensile properties, and heat distortion temperature) must be considered at the initial design stage. The molding process is considered in terms of molding machines, part design, and molding conditions; the molding process strongly affects the physical properties of a part which, in turn, influence its durability after electroplating. The preplate process, which develops adhesion sites on the plastic surface and deposits an adherent electroless metal deposit which provides a durable base for electrodeposition, is discussed in terms of cleaning, etching, mechanical bonding, and chemical bonding. Catalysis, initiation, and deposition (with a comparison between chemically deposited copper and nickel) are outlined. The thermal cycle durability of metal deposit systems (copper-nickel-chromium, nickel-chromium), and the reactivity of each metal layer making up the electrodeposit are discussed as these affect corrosion. The physical properties of the finished product are considered; preprocessing and electroplating conditions apparently do not affect the strength of the metal-electroplated plastic significantly, whereas the characteristics of the metal deposits, including plated-in stress and ductility, should strongly influence the strength.

Publ: Automotive Engineering v87 n5 p34-9 (May 1979)
 1979
 Based on SAE-790215 "Durability of Decorative Electroplated Plastics for Exterior Automotive Use--A Review," by Douglas A. Thompson.
 Availability: See publication

HS-026 189

AXLE REDESIGN SAVES WEIGHT, IMPROVES ECONOMY

Two new lighter axles, designated by Ford as 7.5 in. and 8.5 in. axles, were developed to help meet fuel economy standards and are available on 1979 Ford and Mercury full-sized cars. The 7.5 in. axle weighs 33.17 kg, 9.32 kg less than the previous 8.7 in. axle. The 8.5 in. axle weight of 36.77 kg is 5.73 kg below the previous 8.7 in. axle and 9.62 kg below the previous 9.0 in. straddle-mounted axle. Fuel efficiency and improved handling were primary goals; also included in the initial design assumptions were benefits in improved reliability, manufacturing flexibility, reduction in complexity, common axle ratios, and low ratio capacity. Axle designations were derived from respective nominal ring gear diameters. Both axles were designed to be interchangeable in cars where torque capacity permits. The two

axles share the following design features: cast center section with cast upper control arm bosses for four-link suspension; cast iron shims and automatic selection equipment to adjust differential bearing preload; axle shafts and high strength, low alloy steel housing tubes of equal length; common right and left hand axle shafts and tubes; tube assemblies with 'S'-shaped suspension brackets for lower control arm and shock absorber mounting; common circular companion flange; formed-in-place cover gasket; and axle ratio capability of 2.06:1 to 3.55:1 (7.5 in. axle) and 2.26:1 to 4.10:1 (8.5 in. axle).

Publ: Automotive Engineering v87 n5 p51-4 (May 1979)
 1979
 Based on SAE-790048 "New 7.5 in. and 8.5 in. Ford Axles for 1979," by Denis J. Manduzzi and Paul E. Bak.
 Availability: See publication

HS-026 190

AUTOMOBILE RECYCLING OFFERS RENEWABLE BUT CHANGING RESOURCES

As the material composition of automobiles changes in order to reduce vehicle weight, future car recycling operations will be significantly affected. It is expected that the ferrous fraction (iron and steel) mass/unit will reach a maximum in 1982 and then undergo a steady decrease to about 60% of that amount by 1995. For a number of shredder operations, total ferrous scrap production could be maintained by increasing car volume per unit time. Increased energy, labor, maintenance, material handling, and other costs of processing up to 40% more, but smaller, cars, need to be considered. Many operators will be concerned with increasing their operations' efficiency and locating alternate scrap sources. With regard to the nonferrous fraction based on the average 1978 junk cars, the amounts of available aluminum per unit will increase by a factor of four, zinc will decrease by a factor of ten, and copper and brass will decrease by one-third for the average 1995 junk car. Present shredding and recovery technology should readily accommodate the expected changes in these relative proportions. Increased use of shredding should lead to increases in the gross revenues derived from nonferrous metal recovery. As aluminum use increases, junk car dismantlers might remove these components before selling the hulk to a shredder (who in turn sells to a nonferrous metal recovery plant). The amount of rubber and plastics available from the junk car is likely to increase at an annual rate of about 4% between 1978 and 1995. Processes being developed for recovering materials from industrial waste foam could possibly be modified to handle polyurethane foam automotive scrap (found in air fraction). For handling the nonferrous, nonmagnetic fraction (denser plastics and rubber), the following options are available: continued landfill; separation, recovery, and reuse; energy recovery (as a fuel source); and pyrolysis to produce a variety of chemicals and fuels.

Publ: Automotive Engineering v87 n5 p56-8 (May 1979)
 1979
 Based on SAE-790299 "Effect of Changing Automobile Materials on the Junk Car of the Future," by L. R. Mahoney, J. Braslaw, and J. J. Harwood.
 Availability: See publication

HS-026 191

PIEZOELECTRIC SENSOR DETERMINES CYLINDER PRESSURES

A piezoelectric ceramic ring transducer has been developed to obtain cylinder pressure time histories. The washer-shaped

transducer was designed to be installed between a spark plug and cylinder head. Stress variations from fluctuating cylinder pressures produce a voltage from the piezoelectric ring transducer (PZT). The transducer can be used to detect incipient detonation through the associated high-frequency cylinder pressure oscillations and to aid in determining crank angle at peak cylinder pressure. Closed-loop spark-advance control utilizes cylinder pressure to determine maximum torque (and hence best fuel economy) spark timing. The PZT appears to meet all the following design criteria: generates a strong signal which is clearly distinguishable above background noise; has a bandwidth of at least 15 kHz to detect characteristic detonation frequencies; survives continuous exposure to temperatures of 250 degrees C; is unaffected by temperature at the point where maximum cylinder pressure is detected; and is capable of inexpensive mass production.

Publ: Automotive Engineering v87 n5 p63-5 (May 1979)
1979

Based on SAE-790139 (HS-026 237) "A Cylinder Pressure Sensor for Spark Advance Control and Knock Detection," by Kent W. Randall, and J. David Powell.

Availability: See publication

HS-026 192

PRECHAMBER DECREASES NOX [NITROGEN OXIDES] EMISSIONS

An experimental study analyzed the role of a turbulence-generating pot (TGP) added to the Toyota lean-burn engine in decreasing NOx (nitrogen oxides) generation. This added prechamber has neither a fuel-injection nozzle nor an intake valve; it is charged from the homogeneous mixture in the main chamber during the compression stroke. The spark plug is located in the orifice to improve ignitability of the air-fuel mixture by scavenging around the electrodes. The following information was obtained on a single-cylinder engine with the prechamber (four different configurations) and a conventional engine: statistical measurement of cylinder pressure histories, observation of flame propagation patterns by high-speed motion pictures and ionization gaps; and analysis of gas sampled from the combustion chamber to determine distributions of residual gas and NOx. The effects of the prechamber on residual gas distribution, burning speed, temperature gradient, and cooling loss were examined. It was found that TGP reduces NOx emissions because jet flow from the prechamber causes gas motion in the post-flame region, which leads to a decrease in the temperature gradient of the burned gases, and also increases the cooling loss to the chamber wall. The prechamber causes a change in the burning speed or mass burning rate, but this does not always contribute to decrease in NOx emissions.

Publ: Automotive Engineering v87 n5 p72-7 (May 1979)
1979

Based on SAE-790389 "Effects of a Prechamber on NOx Formation Process in the SI Engine," by M. Konishi, N. Nakamura, E. Oono, T. Baika, and S. Sanda.

Availability: See publication

HS-026 193

LIQUID CRYSTAL DISPLAYS: NEXT-GENERATION INSTRUMENT PANELS?

An LCD (liquid crystal display) is defined as a twisted nematic field-effect device. It is a passive display that operates by the ability of the twisted ordered arrangement of the liquid crystal molecules to rotate (by 90 degrees) polarized light. The dielec-

tric anisotropy of the liquid crystal molecules enables them to move under the influence of an electric field. An LCD is essentially a sandwich consisting of two pieces of glass with liquid crystal material between them; the outside glass surfaces are covered with plastic polarizer material. The operating range for an LCD is dictated by the temperature range over which a material remains in the nematic state. The physical appearance of an LCD is determined by polarizer and reflector types. The display has dark digits on a light background when the polarization axes of the front and back polarizer are at right angles; the display has light digits and a dark background if the polarization axes are parallel. Polarizers can also determine the color of the display, and the use of a colored reflector allows the displays to be any chosen color but these are not in common usage. Multiplexing, although difficult, is the key to alphanumeric displays in automotive applications; by the mid-1980's, sufficient temperature-compensating driver electronics should be available to use multiplexing in this application. The present operating temperature range of an LCD is -10 degrees C to plus 85 degrees C; the lower threshold must be -40 degrees C for automobile applications. Analog displays, pointers, and bar graphs are ideal for automotive display applications where the desired information is rate of change, trends, and set points. In the future, a single, large-area LCD could display all the information found on a conventional automotive dashboard.

Publ: Automotive Engineering v87 n5 p78-81 (May 1979)
1979

Based on SAE-790059 "What Can the Automobile Industry Expect From Liquid Crystal Displays?," by Arthur Berman, Gordon Kramer, Chan Oh, and Paul Smith.

Availability: See publication

HS-026 194

OXYGEN STORAGE IMPROVES THREE-WAY CONVERTER EFFICIENCY

The oxygen storage component of a three-way catalytic converter removes excess oxygen from the exhaust gas stream and maintains high nitrogen oxides removal efficiency during brief lean excursions. Similarly, this stored oxygen extends carbon monoxide and hydrocarbon removal efficiency during the rich excursion of the limit cycle by providing oxygen to the process when little is available from the exhaust stream itself. This process is limited by saturation level for the total amount of oxygen capable of being stored in the catalyst and by storage rate. Thus, the two important exhaust stream characteristics are the concentration of oxidants and the space velocity of the flow through the catalyst volume. Oxidant concentration is directly related to the amplitude of the air-fuel ratio (A/F) deviation from stoichiometry, while the space velocity is related to the frequency of the A/F modulation about stoichiometry. The two important parameters of amplitude and frequency in a limit cycle control system were given close evaluation in designing the Inter-Industry Emission Control Prog. 2 (IIEC-2) concept car. Maintaining the average exhaust gas A/F within a window width as narrow as 0.06 under steady-state conditions (conversion efficiency for three exhaust components greater than 80%), the IIEC-2 concept uses an exhaust gas oxygen sensor. The most significant parameter for the microprocessor-based IIEC-2 engine control system is control of the A/F.

Publ: Automotive Engineering v87 n5 p82-3 (May 1979)
1979

Based on SAE-760201 "Laboratory Evaluation of Three-Way Catalysts," by H. S. Gandhi, A. G. Piken, M. Shelef, and R. G. Delosh; and SAE-790508 "The Microprocessor Based Engine Control System for the IIEC-2 Concept Car," by A. L. Cederquist, S.S. Devlin, D. L. Hart, and R. Moon.

Availability: See publication

HS-026 195

ACCIDENT ANALYSIS, RIDE QUALITY, DRIVER EDUCATION, AND BEHAVIOR RESEARCH

Eleven papers individually discuss the following topics: methodology for ranking roadside hazard correction programs; evaluation of highway safety projects using quality-control technique; Michigan Dimensional Accident Surveillance Model; accident characteristics before, during, and after safety upgrading projects on Ohio's rural Interstate system; vehicle ride quality criteria of multifactor environments; resource impacts of alternative automobile design technologies; consumer costs of unnecessary automobile repairs; portable interactive data acquisition and analysis system for driver behavior research; Michigan's driver education evaluation project (classroom testing and in-car development); evaluation of educational treatment for rehabilitation of problem drivers; and driver education for stress conditions.

Transportation Res. Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418

Rept. No. TRR-672; 1978; 74p refs

Includes HS-026 196--HS-026 206.

Availability: TRB \$4.40

HS-026 196

METHODOLOGY FOR RANKING ROADSIDE HAZARD CORRECTION PROGRAMS

Developed for the Traffic Engineering Branch of the North Carolina Div. of Highways, a computerized system to facilitate the prioritizing of roadside fixed-object treatments is described in terms of development and use. The system is designed to perform economic analyses of various fixed-object improvements on an areawide or roadway segment basis (e.g., determining the effect of removing all trees within 9 m (30 ft) of the edge of pavement on rural, two-lane, secondary roads in the piedmont area of N.C.). Developed inputs for the system include frequency and severity of the accident most affected for each hazard-treatment combination; expected reduction in fatal, injury, and property-damage-only accidents associated with implementation of treatment; and initial, maintenance, and repair costs over treatment service life. System outputs include predicted accident savings, the net discounted present value and benefit-cost ratio for each candidate treatment, and a priority ranking based on comparisons of net present value. Initial runs using the system indicated that the use of transition guardrail at hazardous bridge ends and tree removal in certain locations in the state are promising. System developmental efforts also reemphasized the continuing presence of a serious national problem, i.e., the lack of sound information concerning effectiveness levels for fixed-object countermeasures

by William W. Hunter; Forrest M. Council; Amitabh K. Dutt; David G. Cole

University of North Carolina at Chapel Hill, Hwy. Safety Res. Center

Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p1-9

1978; 11refs

Sponsored by North Carolina Governor's Hwy. Safety Prog.

Availability: In HS-026 195

HS-026 197

EVALUATION OF HIGHWAY SAFETY PROJECTS USING QUALITY-CONTROL TECHNIQUE

A comprehensive traffic engineering project undertaken in Oakland County, Michigan, revealed a need for a simplified and practical methodology for the evaluation of highway safety projects. Although statistical methods of analysis using Poisson and chi-square distributions are available, they are neither suitable for locations with very low accident frequency nor responsive to local conditions or standards. An alternative procedure, the quality-control technique, was therefore developed which overcomes the shortcomings of the other methods and offers the advantages of performing parametric comparisons by facility type or improvement type, utilizing various measures of effectiveness. This procedure can also be adapted for identification of safety-deficient locations. Parametric control charts required for this procedure can be readily prepared by computer or manual methods from existing data for various facility types. In one case study of a safety improvement project (widening a roadway from two to four lanes), quality-control charts demonstrated that the improvement had a significant impact on accident experience.

by Tapan K. Datta; Brian L. Bowman; Kenneth S. Opiela
Wayne State Univ.

Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p9-16

1978; 4refs

Based on a study sponsored by Federal Hwy. Administration.

Availability: In HS-026 195

HS-026 198

MICHIGAN DIMENSIONAL ACCIDENT SURVEILLANCE (MIDAS) MODEL: PROGRESS REPORT

The Michigan Dimensional Accident Surveillance (MIDAS) model being developed by the Michigan Dept. of State Highways and Transportation aims to analyze objectively the entire roadway system (not just worst-accident locations), to select candidate locations for upgrading that are the most sensitive to correction, and to choose sets of the most likely cost-effective corrective measures. The MIDAS model may be visualized as grouping all roadway segments with identical predetermined physical and accident characteristics into one cell of a multicell array. Subsequent statistical analysis, cost estimating, and accident prediction assess probable impacts on transforming all sites from one cell to another. Data sources are several master tapes of accident reports, road features inventory files, and a traffic volume file. The identification of segments having a statistically significant number of accidents and the determination of logical countermeasures work well. The prediction of expected change in accident rate for each corrective action presently lacks precision and requires additional work.

by Thomas L. Maleck

Michigan Dept. of State Highways and Transportation

Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p16-9

1978

Availability: In HS-026 195

HS-026 199

ACCIDENT CHARACTERISTICS BEFORE, DURING, AND AFTER SAFETY UPGRADING PROJECTS ON OHIO'S RURAL INTERSTATE SYSTEM

In 1973, minor safety upgrading projects were conducted at 21 locations on the rural Interstate system of Ohio, involving 618 km (384 mi) of freeways. In 1972, the accident rate per million vehicle km (MVKM) on these 618 km was 112.9 accidents/161 MVKM. In 1974, the accident rate dropped to 77.9 accidents/161 MVKM. To account for the possible effect of the introduction of the reduced speed limit in 1974, accidents rates also were compared on 246 km of the rural Interstate not subjected to safety improvement. The different in proportional reduction in accident rates was found to be statistically significant in favor of the 21 study sites. The accident rates increased to 120.8 accidents/161 MVKM during the 1973 safety-upgrading construction program; but only 151 accidents were positively identified from traffic crash reports and construction diaries as construction-related. A detailed analysis of the 151 accidents revealed the following patterns: rear-end (61) and single-vehicle, fixed-object (56) accidents most frequent; 34 accidents in the relatively short taper area; high proportion of lane taper accidents at night and at dawn or dusk; high proportion of construction-object accidents at night; high proportion of tractor-trailer and bus accidents at night; and excess speed a contributing factor in 88 cases. Road defects or construction or traffic control were listed in only 15 cases. Some suggestions are made for traffic control at work zones.

by Zoltan A. Nemeth; Donald J. Migletz
Ohio State Univ., Dept. of Civil Engineering
Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p19-24
1978

Sponsored in part by Federal Hwy. Administration (Safety Fellowship to Mr. Migletz).
Availability: In HS-026 195

HS-026 200

RIDE QUALITY CRITERIA OF MULTIFACTOR ENVIRONMENTS

A comprehensive ride quality model that accounts for the effects of multifrequency and multiaxis vibration inputs, as well as for the interactive effects of noise and vibration upon passenger comfort, is under development. The model is based upon extensive experimental studies utilizing a realistic multi-degree-of-freedom laboratory simulator located at the National Aeronautics and Space Administration's Langley Res. Center, Hampton, Va. The basic elements of the ride quality model are described briefly; summary data relating to human discomfort response to vertical, lateral, and roll vibrations are presented; and results of an initial study of human response to combined noise and vibration stimuli are provided. Results of studies involving vibration stimuli alone are presented in terms of sets of equal discomfort curves for each axis of vibration. A set of noise-vibration criteria curves is included, based upon the concept of additivity of the discomfort components due to noise and vibration. Quantification of the basic psychophysical relationship between perceived discomfort and vibration stimulus levels provides a very useful tool for determining tradeoffs between passenger comfort and ride environment. Vertical vibration frequencies greater than about 15 Hz are relatively unimportant to ride quality. The frequency masking factor for both vertical and lateral axes is a function of both the bandwidth of vibration and the overall rms acceleration level. Discomfort values produced by individual

frequency components of lateral vibration are less additive than discomfort components within a similar vertical vibration spectrum. For roll acceleration levels greater than 0.40 rad/sec/sec, the separate frequency components of discomfort interact in an antagonistic sense. It is implied that separate but successive noise and vibration criteria may be sufficient for prediction of ride quality in the combined environment when the spectrum characteristics of the noise and vibration are relatively uncomplicated.

by J. D. Leatherwood; T. K. Dempsey; S. A. Clevenson
National Aeronautics and Space Administration, Langley Res. Center, Hampton, Va.
Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p24-31
1978; 20refs
Availability: In HS-026 195

HS-026 201

RESOURCE IMPACTS OF ALTERNATIVE AUTOMOBILE DESIGN TECHNOLOGIES

A computer-based model developed for generating the resource requirements of alternative automobile technologies goes beyond previous tools in its scope, level of impact disaggregation, and flexibility. The Resource Accounting Model projects the annual energy, materials, capital, and labor requirements of the passenger automobile fleet through the year 2000. The methodology integrates a family-tree technique with an input-output approach that generates the capital and labor information. It tracks 24 major materials, with supply disaggregated among primary and recycled materials, imports, and domestic sources. Net energy consumption is derived, along with capital and labor impacts disaggregated by 90 industries. The model has been applied to examine a broad range of scenarios encompassing various automobile design technologies and constraints imposed by safety and emissions regulations. All the scenarios show fleet fuel consumption declining through 1985, as the gains in fleet fuel efficiency outweigh the growth in distances traveled. With a few exceptions, the weight-conscious designs and innovative structures result in a significant reduction in consumption of the major materials used in automobile production. Increased capital expenditures in the automobile industry are offset by capital savings in other sectors of the economy. Employment impacts of the scenarios were relatively small.

by Bruce Rubinger
Transportation Systems Center, Energy Programs Div., Cambridge, Mass.
Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p31-5
1978; 8refs
Availability: In HS-026 195

HS-026 202

CONSUMER COSTS OF UNNECESSARY AUTOMOBILE REPAIRS

Some results are presented of a three-year automotive diagnostic inspection program in Huntsville, Ala., known as Auto Check, whose purpose was to collect and analyze auto repair cost data, especially data on unnecessary repairs. Auto Check was established by the National Hwy. Traffic Safety Administration in the fall of 1974 as one of five diagnostic inspection demonstration programs. In the present study, brake, engine, alignment, steering, and suspension repair costs for 1968-1973 model year

vehicles were analyzed relative to 106 items inspected by Auto Check. It was found that of all repairs, 25% were unnecessary and represented 29% of the repair costs. After the vehicle owners were given Auto Check inspection results to present to the repair industry, the unnecessary repair rate was reduced to 13%. High unnecessary repair rates were found for control arm pivots (82%), brake discs or drums (60% rear and 58% front), and rear wheel seals (47%). Local car dealers who performed the most cost-effective repairs also had more than their share of business. Chain stores with the lowest unnecessary repair rates had the greatest business. Out-of-Huntsville car dealers had a significantly lower unnecessary repair rate (17%) than the Huntsville car dealers (25%). The rate of repair to the engine and suspension increased after the participants were given Auto Check prescription forms and was reflective of the rate of observed outage. After the participants were given the forms, the market share increased for chains and tire dealers, decreased for service stations, independents, and owner repairs, and remained the same for car dealers. Diagnostic inspection and effective communication of repair needs to the repair facility are found effective in reducing unnecessary repairs.

by Bernard J. Schroer; William F. Peyton; Kenneth E. Johnson
University of Alabama in Huntsville, Environmental and Energy Center
Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p36-44
1978; 4refs
Availability: In HS-026 195

HS-026 203

PORTABLE INTERACTIVE DATA ACQUISITION AND ANALYSIS SYSTEM FOR DRIVER BEHAVIOR RESEARCH

A car-portable system has been developed to perform driver behavior measurements during roadway experiments; the system is microcomputer-controlled (LSI-11) and features multichannel sampling capability, on-line operator control of experimental parameters, and on-line data reduction capability. The system is powered by the car using a high current alternator (105A) and an extra battery. Transducers measure lateral position on the roadway, ground speed, vehicle acceleration, brake pedal force, accelerator position, and steering wheel position. The system has been used by the Road Safety Unit of Transport Canada since the spring of 1977. Continued progress in microcomputer and data acquisition technology will probably lead to higher sampling rates and relatively lower costs.

by B. C. Eatock; W. W. Demmery; R. D. Williams; D. A. Attwood
Defence and Civil Inst. of Environmental Medicine, Downsview, Ont., Canada; Transport Canada, Road Safety Unit
Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p44-9
1978; 3refs
Availability: In HS-026 195

HS-026 204

MICHIGAN'S DRIVER EDUCATION EVALUATION PROJECT: CLASSROOM TESTING AND IN-CAR DEVELOPMENT

Rather than use the traditional measurement of accident and violation rates in its evaluation of statewide driver education programs, the Michigan Dept. of Education investigated stu-

dents' cognitive skills by means of objective-referenced tests. Previously, minimal performance objectives for both classroom (cognitive) and in-car (psychomotor) portions of driver education had been developed. After finalizing the objectives, test items were developed, focusing on classroom objectives. Following pilot testing of the classroom items, 60 objectives were selected for statewide administration. Objective-referenced tests enabled not only the education department but also individual teachers to know the strengths and weaknesses of students and classroom environments. Each classroom objective was measured by five items; to attain an objective, a student would have to answer at least four items correctly. Statewide, the a priori criterion was that 80% of the students would attain each objective. Results based on approximately 100,000 students show that only 13 objectives met the criterion level, indicating that instruction of driver education needs improvement. As skills became more advanced, it was found that attainment decreased. An in-car measure was developed and administered to 30 students to determine its reliability (and that of trained raters). Forty students were used to validate the measure against the Michigan State Univ.'s Driver Performance Measure. The test component categories are sum of entire test, drive, search, speed, direction, familiarization, and signs, representing a total of 147 observations. Results for both studies were positive, but time did not permit pilot testing of the in-car measure on a stratified sample of students.

by Kara L. Schmitt
Michigan Dept. of Education, Res., Evaluation, and Assessment Services, Lansing, Mich.
Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality, Driver Education, and Behavior Research," Washington, D.C., 1978 p49-57
1978; 9refs
Prepared in cooperation with Michigan Office of Hwy. Safety Planning, and National Hwy. Traffic Safety Administration.
Availability: In HS-026 195

HS-026 205

EVALUATION OF EDUCATIONAL TREATMENT FOR REHABILITATION OF PROBLEM DRIVERS

A unique rehabilitative treatment for improving problem driver performance, entitled Responsible Driving, was developed and evaluated in Florida. The treatment places emphasis on group discussion of concepts and principles derived from transactional analysis, a theory of personality developed by Dr. Eric Berne. In order to test the treatment effectiveness, hearing officers from five Florida cities randomly assigned 432 problem drivers to an experimental treatment group, a Defensive Driving Course (DDC) group, and a control group. All subjects had lost their driver's licenses and were attempting to obtain a temporary license for some hardship reason. Safety officers from the Florida Hwy. Patrol taught both the Responsible Driving and DDC courses. Written pretests and posttests were administered for study subjects, and the driving records of the subjects were followed for 12 months. All groups had high pretest scores and showed no significant improvement at posttest. Results show that the experimental treatment was significantly more effective (p equals 0.05) than no treatment in reducing the number of traffic collisions and moving violation convictions. The DDC was not significantly different from any group at p equals 0.05. Although the findings may be questioned due to small sample size and lack of rigorous supervision in its conduct, there is evidence to support the use of the new treatment for helping problem drivers improve. It is recommended that this treatment be evaluated in a larger, more rigorous study.

by Jon C. Prothero; Thomas A. Seals
Florida State Univ., Traffic Education Evaluation Proj.
Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality,
Driver Education, and Behavior Research," Washington, D.C.,
1978 p58-63
1978; 30refs
Availability: In HS-026 195

HS-026 206

DRIVER EDUCATION FOR STRESS CONDITIONS

A set of driver performance training activities has been developed to prepare drivers to handle a vehicle under such stress conditions as tire failure, skid situations, off-road recovery when one or more wheels drop off pavement, and to properly steer vehicle, to evade sudden impending dangers, and to brake the vehicle without losing control. The program was developed from information obtained through a literature search and through experiences gained by participating in training programs previously developed by such organizations as Liberty Mutual Insurance Co., General Motors Proving Ground, and the National Safety Council. The curriculum for this training course includes classroom instruction, including use of a fixed-base simulator presentation to prepare drivers for actual driving maneuvers, and in-car exercises to develop skill in performing these maneuvers. The curriculum has been evaluated using recruits from the Greater St. Louis Police Acad. One group who received training significantly increased their performance on posttests of knowledge, low-speed skill, and increased-speed skill, while the untrained group improved only their low-speed skill. The advanced driver education program is being used in workshops for emergency vehicle operators throughout the state of Missouri, and at Whiteman AFB, Mo., to provide training for all drivers of military vehicles.

by Robert A. Ulrich
Central Missouri State Univ., Safety Dept., Warrensburg, Mo.
64093
Publ: HS-026 195 (TRR-672), "Accident Analysis, Ride Quality,
Driver Education, and Behavior Research," Washington, D.C.,
1978 p63-8
1978; 7refs
Availability: In HS-026 195

HS-026 207

TRENDS IN FEDERAL DOMESTIC TRANSPORTATION PROGRAMS, REVENUES AND EXPENDITURES BY STATE. FISCAL YEARS 1957- 1975. FINAL REPORT

In addition to expenditures, revenues generated are reported and a detailed discussion provided on the historical evolution of Federal transportation revenue and expenditure programs. Only transportation capital and operating programs are reported (with the exception of the Automobile Excise Tax which was repealed 16 Aug 1971); the intent is to identify and include only those programs which provide some physical development and program funding to the various modal systems. Revenue programs included the Federal Hwy. Trust Fund, the Automobile Excise Tax, and the Airport and Airway Trust Fund. Major expenditure programs include highways (National Interstate and Defense Highways, Federal-Aid Primary, Secondary, and Urban Systems, miscellaneous highway programs); air (Federal-aid to Airport Prog./Airport Devel and Aid Prog., National Airspace System, Civil Aeronautics Board Air Carrier Subsidy Prog.); mass transit (Urban Mass Transportation Administration); water (Coast Guard, Corps of Engineers); and rail (Feder-

al Railroad Administration). Federal transportation revenues and expenditures have demonstrated rapid growth over the 1957-1975 period. Several new revenue and expenditure programs were initiated during this period, which both stimulated growth and created some shifts of emphasis. A significant shift in expenditure patterns has occurred, from predominantly rural in 1957 to predominantly "urban" (i.e. within Standard Metropolitan Statistical Areas) by 1975.

by Clifford W. Woodward, Jr.
Department of Transportation, Intermodal Studies Div., 400 7th
St., S.W., Room 9216, Washington, D.C. 20590
Rept. No. DOT-P-10-78-46; 1978; 306p refs
Updating, refinement, and expansion of "Estimated Federal
Expenditures on Domestic Transportation Capital Improvement
and Operating Programs," Apr 1974.
Availability: NTIS \$11.75

HS-026 208

DEVELOPMENT OF A SAFE ROAD CROSSING INTERVAL TRAINING PROCEDURE FOR PRIMARY SCHOOL CHILDREN

An experimental safe-road-crossing-interval discriminating training procedure based on the use of films and a counter-conditioning reinforcement procedure for correct and incorrect responses was tested by application to the total population (339) of a suburban Melbourne, Victoria (Australia) primary school. Subjects receiving information feedback by display of the consequences of incorrect judgements and symbolic confirmation of correct responses performed significantly better in post-training responses to test films than control subjects merely repeating the discrimination task. The advantage of the feedback group was mainly a function of post-training deficits in the performance of the nonfeedback groups and of an unusual gain in performance of second grade students to which sampling errors probably contributed. Significant gains for information feedback training across test periods for a small control sample of sixth grade boys tested individually suggest that control of test conditions was an important factor. Reevaluation is recommended in the form of a small-scale repetition of the experiment with carefully controlled test conditions. The analysis shows that the procedure has a potential diagnostic value for identifying unsafe road crossing judgments and specifying a remedial course of instructions. Improvements in both materials and procedures are indicated.

by Robert K. McKelvey
Monash Univ., Human Factors Group, Wellington Rd.,
Clayton, Vic. 3168, Australia
Rept. No. HFR-9; 1978; 44p 15refs
Sponsored by Commonwealth Dept. of Transport (Australia).
Availability: Road Safety Information Service, G.P.O. Box
1839Q, Melbourne, Vic. 3001, Australia

HS-026 209

RESTRAINING THE CHILD IN A CAR. SEMINAR CONDUCTED BY THE ROAD TRAUMA COMMITTEE OF THE ROYAL AUSTRALASIAN COLLEGE OF SURGEONS, MELBOURNE, AUSTRALIA, ON 1ST APRIL, 1978

Six papers on child restraints cover the following topics: present situation of Australian child restraint legislation, effects of child restraint legislation in Victoria, different restraint systems for different ages of children, practical aspects of child restraint system use, fitting of child restraints into vehicles, and use of adult seat belts by children.

Royal Australasian Coll. of Surgeons, Road Trauma Com., Coll. of Surgeons' Gardens, Spring St., Melbourne 3000, Vic., Australia
1978; 81p refs
Includes HS-026 210--HS-026 215.
Availability: Corporate author

HS-026 210

PRESENT SITUATION OF AUSTRALIAN LEGISLATION COVERING CHILD RESTRAINTS

Legislation is reviewed relating to restraints for children under eight years of age; no legislation exists for restraining recumbent and semi-recumbent infants. The legislation covers seats and harnesses submitted for approval by the Standards Assoc. of Australia (SAA). Progress over the past decade is marked by the development and revision of the SAA standard, improved quality of child restraints, and increased usage. One design rule (ADR34) has been implemented to provide for upper anchorage points to facilitate the interchange of child restraints between vehicles. Compulsory restraint requirements apply to different groups of children in each State which has enacted legislation. Recommendations for further measures include adoption of child restraint legislation by the remaining States and Territories, covering children from five to eight years old, and revision of existing legislation to improve ease of enforcement. Also recommended are improvements to the design and range of restraints for babies and sleeping children and increased availability of booster cushions. The Office of Road Safety's national publicity campaign is endorsed. Information used for the campaign includes the need to be restrained, the applicability of particular restraints for certain age groups, and the increased safety of rear seat locations compared with front seats. Availability of approved restraints, public awareness of the need for wearing restraints, legislation for compulsory wearing of restraints, and enforcement are all needed for success in protecting child motor vehicle passengers.

by C. J. Boughton
Road Safety Information Service, Office of Road Safety, Australia
Publ: HS-026 209, "Restraining the Child in a Car" Seminar, Melbourne, 1978
1978; 7p 10refs
Seminar held in Melbourne, 1 Apr 1978.
Availability: In HS-026 209

HS-026 211

EFFECTS OF THE VICTORIAN CHILD RESTRAINT LEGISLATION

Child restraint usage surveys were conducted in Melbourne, Victoria (Australia) in Sep 1975, Dec 1976-Feb 1977, and Dec 1977-Feb 1978 to study the effect on wearing rates of the Jan 1976 child restraint legislation enacted in Vic. The legislation requires that all children under 8 years old sitting in the front seat must wear an approved child restraint. Survey data show that the legislation has been successful in transferring these children from the dangerous situation of being unrestrained in the front seat to the safer rear seat. The proportion of unrestrained children in front seats has fallen from 15% in 1975 to 5% one year after legislation and 6% two years later. It appears that the law had an effect on casualties among child occupants under 8 years of age during 1976 (an 11% reduction under 1975, vs. a 4% reduction for occupants over 8 years of age, and a 2% increase for drivers). In 1976, front-seat casualties of children under 7 years of age were reduced to 112, vs. 236 in 1975.

Unfortunately, there was an increase in rear-seat child casualties from 360 in 1975 to 394 in 1976, presumably because of a transfer of children from the front to the rear seat. About two-thirds of rear-seat child passengers continue to be unrestrained.

by A. P. Vulcan
Road Safety and Traffic Authority, Australia
Publ: HS-026 209, "Restraining the Child in a Car" Seminar, Melbourne, 1978
1978; 13p 6refs
Seminar held in Melbourne, 1 Apr 1978.
Availability: In HS-026 209

HS-026 212

RESTRAINING CHILDREN IN CARS: THE USE OF SYSTEMS AT DIFFERENT AGES

Age differences in restraint use among children under 8 years of age are outlined, based on a large-scale household survey of child restraint usage and attitudes in Sydney, New South Wales (Australia) which involved in-depth interviews with a representative sample of 1200 women who had at least one child under 8 years and a family car. The survey found that the age of the child was the single most important factor influencing restraint availability and use. It was determined that babies under 6 months are rarely restrained in the car. In any case, no bassinet restraints available have SAA (Standards Assoc. of Australia) approval. The poor protection available for infants is counterbalanced to a degree by the fact that they ride in a car less frequently than older children. The large majority of children aged 6 months to less than 3 years were found to have a child restraint (usually a child seat) available in the family car, and most of these children were said to use the restraint on every car trip. The majority of child seats had SAA approval, but unapproved seats were not uncommon. Relatively few children aged 3 to less than 8 years had a child restraint, although many children in this age group rode in a car every day. While the majority of children aged 3 years and over were found to have an adult seat belt available, less than half were belted on every car trip. It was indicated that on most trips a mother will restrain her younger child in the car because of benefits other than crash protection. These practical benefits, more apparent for a child under 3 years than one older, include provision of support for child during normal driving, prevention of child's access to door handles and controls, a more enjoyable trip for child because of higher seating position, and minimal time and effort to place child in restraint.

by K. Freedman
Department of Motor Transport New South Wales, Traffic Accident Res. Unit., N.S.W., Australia
Publ: HS-026 209, "Restraining the Child in a Car" Seminar, Melbourne, 1978
1978; 8p 3refs
Seminar held in Melbourne, 1 Apr 1978.
Availability: In HS-026 209

HS-026 213

PRACTICAL ASPECTS OF CHILD RESTRAINT SYSTEM USE

A four-part study investigated whether the newest types of child seats (Australian use), which have been adjusted to the user in different ways, are actually easier to use, and if so, whether this influences the circumstances and frequency of use. A comparison was made of different buckle-harness systems with regard to how quickly a child dummy (2-year-old) could be removed from them during emergency conditions (simulated

darkness). Results indicate a significance difference among seats, one buckle-harness system taking six times as long to remove as the easiest-to-use system. An investigation of the ability of young children (2 to 4 years) to open the buckles on five different child seats indicated that all of the restraint systems were acceptable in keeping the child restrained. A questionnaire study was made to obtain a picture of the general use of and attitudes toward child restraint systems in Melbourne, Victoria (Australia). One-third of the parents were found to be dissatisfied with their child restraint systems in terms of child comfort and safety, and 98% of the parents were in favor of a mandatory child restraint use law. Five different child seats were allocated to Melbourne parents; parents were asked to select one seat for installation in their cars and to fill out a questionnaire regarding the reasons for their choice. One of the most important findings is that individual families have very different needs which in turn influence the type of seat chosen. Child's safety was emphasized very little. The most important difference in opinion was whether to use the seat in the front or back of the car. More information will be obtained following two-week, six-month, one-year, and two-year use of the seats.

by Peter W. Arnberg; Lenore Arnberg; Gordon W. Trinca
Royal Australasian Coll. of Surgeons, Road Trauma Com., Coll. of Surgeons' Gardens, Spring St., Melbourne 3000, Vic., Australia

Publ: HS-026 209, "Restraining the Child in a Car" Seminar, Melbourne, 1978

1978; 32p 8refs

Seminar held in Melbourne, 1 Apr 1978.

Availability: In HS-026 209

HS-026 214

THE FITTING OF CHILD RESTRAINTS INTO VEHICLES. DR. PETER ARNBERG EXPERIMENTS, MELBOURNE, FEBRUARY/MARCH 1978

A study conducted by Dr. Peter Arnberg (Royal (Australasian Coll. of Surgeons) involved the fitting of five different child seat designs (Steelcraft, Safedrive, Klippan, Volvo, and Safe-n-sound) in the vehicles of Melbourne residents, the examination of the restraint system installations after two weeks of practical use, and the questioning of parents about their experience with the child seats. Methods of attaching/securing (front and rear seats) and factors influencing installation are outlined, and findings are reported from the follow-up examination of the restraints for their securing into the vehicle and adjustments made to the harnesses. It was found that a large number of the child restraints had been removed from the vehicles, and that despite careful instructions a very large number of parents had not effectively resecured the restraints. The main problem appeared to be the reattachment of those restraints held in place solely by adult belts. It was found that adjustment of the child harness was not as satisfactory as it could have been; harness readjustment to compensate for changes in a child's clothing resulted in a compromise adjustment. Emphasis must be placed on educating parents in proper removal and reinstallation of child restraints.

by Graeme Harvey
Royal Melbourne Inst. of Tech., Mechanical Engineering Dept., Melbourne, Vic., Australia

Publ: HS-026 209, "Restraining the Child in a Car" Seminar, Melbourne, 1978

1978; 10p

Seminar held in Melbourne, 1 Apr 1978.

Availability: In HS-026 209

HS-026 215

USE OF ADULT BELT BY CHILD; A NEW CONCEPT

The development of a unique concept in child restraints, the Hi-Rider Safety Seat, is described from conception to marketable product. With the use of this new product, automatic geometry correction to the adult seat belt is achieved. Not only is the lap belt geometry improved, but the sash strap line has been moved away from the child's neck to the shoulder portion, as for an adult using a modern seat belt installation. Cutouts in the sides of the device correct the geometry and move the adult buckle and tongue away from contact with the child. This construction tends to "lock" the webbing under impact conditions, thereby effectively decreasing the displacement of device and child. Dynamic sled tests of the device using dummies showed no submarining even with loose adjustment (vs. some tendency to submarine for standard restraints.) Features of the new child restraint include automatic conversion of existing seat belts into an effective child restraint, repositioning of lap and sash portions to be safer and more comfortable, elevation of child to window height, instant adaptation to any motor vehicle and seating position, firm support of child under normal and impact conditions, and provision of a lightweight, durable, and non-flammable seat which can be used outside the vehicle.

by Thomas G. Molnar

Recco, Ltd., Cooldrive Consolidated Industries Div., Australia

Publ: HS-026 209, "Restraining the Child in a Car" Seminar, Melbourne, 1978

1978; 9p 6refs

Seminar held in Melbourne, 1 Apr 1978.

Availability: In HS-026 209

HS-026 216

SAFETY: MAKING MINI-CARS UNHAZARDOUS TO HEALTH

The Dept. of Transportation's Res. Safety Vehicle (RSV) program, entering the final testing stage, has answered many of the concerns surrounding subcompact and compact vehicle safety. Of the two RSV projects, the Calspan/Chrysler car contains several modifications which have allowed minimal passenger compartment damage and fewer projected occupant injuries in preliminary tests at 47 mph. A forward transverse engine, energy-absorbing foam panels, and breakaway steering column have contributed substantially to improved occupant safety in barrier and multivehicle collision tests. These test results indicate that well over 18,000 lives could be saved annually. Structural changes, such as longer redesigned front longitudinals, are incorporated in the Calspan/Chrysler RSV to help absorb kinetic energy in a collision. The Minicars RSV, the result of the second project, has shown much of the same progress, attributable to similar design modifications, including the addition of energy-absorbing foam blocks in strategic body positions. Both RSV's hope to offer more protection to the pedestrian. Chrysler/Calspan has built a 31-lb, low-density, urethane-foam bumper surrounded with a higher-density urethane skin which offers protection at speeds up to 20 mph. Passive restraints, padded B-pillars, and cushioned door panels are included in both RSV units. The Minicar RSV features high strength roll bars and roof struts, and gullwing doors. Extensive crash testing, fuel economy surveys, and an examination of handling characteristics will be conducted on the ten Chrysler/Calspan cars by experts from five nations, with Japan presently committed to testing the Minicars RSV when the test units have been constructed.

HS-026 217

by Douglas Rambo
Publ: Automotive Industries v159 n5 p42-5 (May 1979)
1979
Availability: See publication

HS-026 217

TESTING: COPING WITH THE CRUNCH [DEVELOPMENT ENGINEERING, AUTOMOTIVE INDUSTRY]

Faster data collection and analysis, faster mileage accumulation methods, and test planning are incorporated by the automotive industry to meet the almost doubled time and space demands of testing thousands of new components. The computer is most responsible for helping development engineers accelerate data collection and processing. Computers not only run actual vehicle tests and analyze test data, but also dynamically analyze a designed car before it is built. Minicomputers have improved measurement accuracy via mobile data acquisition (strain gauges and other sensors). Proving grounds are used by automakers and component suppliers to subject vehicles to repeated exposures of the harshest climate and road conditions. Emission labs measure fuel economy and pollutants, and crash test facilities use simulators to study impact effects on new materials and designs. Chassis dynamometers, or mileage accumulators, are generally used for emission and fuel economy testing on stationary vehicles (with powered wheels on rollers). A type of mileage accumulator, the road simulator, uses sensors to measure stress points on a vehicle under different driving conditions. Tire manufacturers use various approaches to accumulate miles to measure wear on tires (e.g. tractors (pulling trailers) tethered to a pole and run in circles at preset speed, resiliometers). Other tire tests include the use of a wheel assembly with tire attached which is run up and down a narrow steel track, with a transducer to measure rolling-resistance forces and noise; and holography to view the inside of a tire during a test. Risk analysis (including a fault tree, or logic model) is undertaken by the design engineer to determine what should be tested on a component or vehicle in terms of cost, and probability of failure.

by John McElroy
Publ: Automotive Industries v159 n5 p46-54 (May 1979)
1979
Availability: See publication

HS-026 218

GASOHOL. NO THREAT TO U.S. CARBURETORS

Gasohol will not damage fluorohydrocarbon rubber needle valve tips used in many of today's carburetors, according to Vernay Labs. (Yellow Springs, Ohio) which makes these valve tips for 95% of U.S. cars, as well as a substantial portion used worldwide. These valve tips have been installed in several million engines running on gasohol without any complaints of problems with the present blend. Similar confidence in these elastomeric products was expressed by Du Pont Co. which manufactures Viton, the basic material used in the carburetor needle valves. Although the elastomer tips usually swell slightly when exposed to gasohol after a time, no performance problems have been reported with any gasohol blend (even up to 30% alcohol), and no significant performance difference with either ethanol or methanol. While better sealability was the original advantage of these valve tips when they were introduced in 1960, a subsequent unexpected advantage is their durability. Vernay says that its needle valve provides up to 2 mpg more fuel economy in some cars by reducing fuel leakage, and con-

trols the fuel flow better, improving the fuel-air ratio and reducing emissions.

by Joseph M. Callahan
Publ: Automotive Industries v159 n5 p59-60 (May 1979)
1979
Availability: See publication

HS-026 219

VARIABILITY OF THE BLOOD: BREATH ALCOHOL RATIO IN VIVO

Clinical studies were conducted to measure changes in the blood/breath alcohol ratio of 21 male subjects during ethanol metabolism in order to determine inherent biological variations in the ratio. Triplicate capillary blood samples were taken from a subject's fingertip at regular intervals after drinking, usually every 30 to 60 min for a total of 7 hrs. Breath samples were analyzed by a Mark 2 Gas Chromatograph Intoximeter immediately before and after blood sampling, the interval between duplicate determinations being 2 to 3 min. A blood/breath ratio of 2100:1 (medicolegal standard) was used to convert the result of breath alcohol analysis into corresponding blood alcohol concentration (BAC). It was demonstrated that the blood/breath alcohol ratio varies from subject to subject and even within the same subject from time to time. The biologically derived variation was 8.7% of the mean ratio. The biological sources of variation under field conditions may be expected to be even greater. The factors accounting for this variability include the physiology and dynamics of ethanol uptake into tissue and the kinetics of ethanol metabolism. The variation in temperature of exhaled breath is a contributory factor. A change of 1 degree C will change the BAC and hence the blood/breath ratio by 6.5%. In practice, breath alcohol analysis for medicolegal purposes may be expected to be carried out after the peak concentration has been reached. The 2100:1 ratio is therefore too low for unbiased estimates of BAC during this phase of metabolism. A medicolegal definition of impairment in terms of these low estimates of BAC is supported, since they operate in favor of the person tested.

by A. W. Jones
Publ: Journal of Studies on Alcohol v39 n11 p1931-9 (Nov 1978)
1978; 16refs
Presented in part at 7th International Conference on Alcohol and Road Traffic Safety, Melbourne, Jan 1977. Research sponsored by Swedish Medical Res. Council, and National Swedish Police Board.
Availability: See publication

HS-026 220

"WE MUST DO NOTHING LESS THAN RE-INVENT THE CAR"

A Feb 1979 two-day conference in Boston on future automotive technology drew over 700 international delegates from industry, universities, and government, who responded to Secretary of Transportation (DOT) Brock Adams' invitation to participate in a discussion of promising avenues of future automotive research. The conference stemmed from a speech by Secretary Adams which called for a government-industry partnership to "reinvent the car" in view of the increasing intensity of the U.S. oil situation. At the Boston conference, the DOT Secretary challenged the assembled engineers and scientists to draft a list of new technologies needed to develop a fuel-efficient, crash-worthy, environment-minded, and consumer-acceptable car. The delegates were assembled to face together the difficult task of

modifying and improving the automobile of 1979 to meet the environmental, safety, and fuel needs of the 1990's, and they were aware of the necessary tradeoffs. Presentations on 1990's technology needs often referred to existing problems that must first be resolved (e.g. educating public on tire inflation, better traffic management). Basic to discussions on fuels and power-train systems was the fact that now only 10% to 15% of a vehicle's potential energy is used to move the wheels. Other discussions centered on the nature of the motor vehicle fleet of the 1990's. Secretary Adams concluded that the panel results indicate the possibility of achieving a substantial improvement in mileage. The panel findings and transcripts of the conference were given to DOT automotive specialists for coordination into a working agenda for a top-level meeting of government and industry in Washington in spring, 1979. Separate sections outline the DOT "Inventors' Seminars" and the Interagency Task Force on Advanced Automotive Res.

by Richard Shea
Department of Transportation, Office of Public and Consumer Affairs, Washington, D.C. 20590
Publ: Transportation USA v5 n3 p2-7 (Spring 1979)
1979
Availability: See publication

HS-026 221

FUTURE OF BIG CARS IN THE USED CAR MARKET UNCERTAIN

The editor of Automotive Market Report states that in the used car market, the trend is definitely to smaller cars (subcompacts, compacts, and intermediates), that they are dominating the market today and will likely continue to do so. For example, the Ford Pinto, which has a bad reputation for fuel-tank problems, is commanding surprising prices. Outstanding sales performance also applies to such small cars as Vegas (used), Aspens, and Volares, which a year ago were difficult to sell. In spite of the controversial review of the Omni and Horizon by Consumer Reports, these two cars are now popular. In the future, cars will continue to get smaller and lighter for better fuel economy, and will be the industry's leaders. Unless automakers can sell enough small cars to offset the less fuel-efficient bigger cars in the corporate average fuel efficiency figures, they are not going to be able to market many big cars, and there will be fewer big used cars. On the other hand, if the industry can develop more fuel-efficient engines, the big car might actually make a big comeback. An important fact is that many people who have bought small cars have found that they like them.

by Syd Friedlander
Publ: Automotive Fleet v18 n7 p80-2 (May 1979)
1979; 3refs
Availability: See publication

HS-026 222

WANT TO BUILD A KIT CAR?

Legal requirements are discussed for kit or home-built cars, usually consisting of a newly fabricated fiberglass body placed upon the chassis of a vehicle previously in use. The National Hwy. Traffic Safety Administration (NHTSA) considers any kit car customer who completes his car and puts it on the street to be a manufacturer. All manufacturers, whatever their annual production, must comply with all applicable Federal Motor Vehicle Safety Standards (FMVSS's), unless receiving an exemption. Most kit cars are officially considered used cars and are therefore exempt from FMVSS's which apply only to new

motor vehicles. On the other hand, if the kit incorporates new components subject to Federal Safety Standards applicable to new motor vehicle equipment (e.g. glazing, seat belts), the components must comply with Federal requirements. NHTSA does not initiate enforcement action against an individual who assembles a single vehicle for his own use. The major hurdle in licensing a kit car are not NHTSA regulations, but pre-licensing inspection by the local department of motor vehicles or highway patrol, during which common safety items are checked.

by Glenn Brinks
Publ: Road and Track v30 n10 p100 (Jun 1979)
1979; 4refs
Availability: See publication

HS-026 223

EXTERNAL CARBURETOR ADJUSTMENTS

Instructions (including illustrations) are provided to the auto mechanic for the servicing of carburetors. Two representative 1979 carburetors, a 2-barrel and a 4-barrel, best illustrate the adjustments which are now necessary because of more complex carbs to meet fuel economy and emissions requirements. Preliminary tests are recommended to the technician to isolate the carburetor as the malfunctioning component. The following adjustments are detailed for the 2-barrel carb, specifically the Carter BBD, used on late model AMC and Chrysler cars and a good example of an emission-controlled carburetor: idle setting, accelerator pump stroke, bowl vent, fast idle cam position, choke vacuum kick, choke unloader (wide open kick), and fast idle speed. The 4-barrel carb example is the Carter Thermo-Quad (found on Chrysler V-8 engines); while this carb has all the traditional circuits, the vacuum kick diaphragm also controls the secondary air valve. The following adjustments are detailed for the Thermo-Quad: secondary air valve alignment, secondary air valve opening, secondary air valve spring tension, choke diaphragm connector rod, choke vacuum kick, fast idle cam position, choke unloader, secondary lockout, idle setting, accelerator pump stroke, solenoid bowl vent valve, fast idle speed, throttle position transducer, and idle enrichment valve. The propane adjustment method for setting idle mixture to comply with emission standards is outlined in a separate section, as are troubleshooting carb complaints (cold-start, cold-engine driveability, and warmed-up driveability symptoms) and their various causes.

by Ken Zino
Publ: Motor v151 n3 p60-2, 64, 66, 69 (May 1979)
1979
At head of title: Motor Clinic Series.
Availability: See publication

HS-026 224

U.S. DEPARTMENT OF TRANSPORTATION 11TH ANNUAL REPORT, FISCAL YEAR 1977

Dept. of Transportation activities are summarized for the following areas during fiscal year 1977: policy, reorganization plan, environmental protection, deepwater ports, liability insurance, maritime, aviation, highways, railroads, urban transportation, and materials transportation. Following are progress reports by the Office of the Secretary, Coast Guard, Federal Aviation Administration, Federal Hwy. Administration, Federal Railroad Administration, National Hwy. Traffic Safety Administration, Urban Mass Transportation Administration Saint Lawrence Seaway Development Corp., and Materials Transportation Bureau. Tabulated statistics are appended.

Department of Transportation, Washington, D.C. 20590
1979; 73p
Availability: GPO, stock no. 050-000-00145-8

HS-026 225

FEWER BUY, MORE DIE [MOTORCYCLE SAFETY]

In 1977, though 600,000 fewer motorcycles were on the roads, motorcycle deaths increased 23% nationwide to 4098. Safety experts blame the increased fatalities on the repeal of safety helmet laws in 26 states. The motorcycle industry denies this explanation, attributing the increase to more and larger motorcycles, to longer trips in rainier weather, and to government failure to promote training in schools. In many states licensing requirements are lax. In 1966, after the DOT was empowered to withhold Federal highway funds from any state not requiring safety helmets, such laws were accepted by 47 states, but ten years later DOT's power was withdrawn. A large increase in fatalities followed in the states that repealed the mandatory helmet law; e.g., a 41% increase in Ohio. Fresh support is now building for strict helmet laws. Rider education and skill testing have been promoted; the Motorcycle Safety Foundation, funded by the motorcycle industry, awards grants to school districts and police departments for training purposes. Responsibility for accidents can be partly attributed to automobile drivers' failure to notice motorcycles. Suggestions for overcoming the problem include more and brighter headlights and reflective tape for the motorcycle. Improved controls are recommended to permit the motorcyclist to concentrate on traffic and road conditions. Recommendations for motorcyclists emphasize use of a helmet with reflecting tape, a face shield and goggles, use of headlight at all times, and familiarity with controls by touch. Machines should never be borrowed or loaned; cyclists should not travel in groups larger than four cycles, and should never drink and ride.

by Chris Barnett
Publ: Parade p19-21 (13 May 1979)
1979
Availability: See publication

HS-026 226

AN INVESTIGATION INTO ASPECTS OF BUS DESIGN AND PASSENGER REQUIREMENTS

An investigation was undertaken, Phase 1 of which covered the physical capabilities of passengers and their design preferences. After testing with a static wooden mock up of a bus floor layout, 200 elderly and disabled subjects were questioned; the height of the first step was identified as the major inhibiting physical aspect in using buses. Later tests quantified the capabilities of these subjects for step climbing and handrail use. Further tests included measurement of nine major body dimensions, various capability tests for reach, strength and step climbing, seat height, spacing, comfort and position preference, handrail diameter, shape and spacing and entrance configurations of steps and handrails. Phase 2 covered five aspects: doorway handholds; in-the-seat analysis of the distribution of Jerk levels and possible improvements; going to and from the seat; step height and retractable step; and a study of accident data over a period of 12 months by 30 bus operators, covering about 30,000 vehicles in the UK. Specific recommendations for design improvement and driver training are provided.

by B. M. Brooks
Publ: Ergonomics v22 n2 p175-88 (1979)
1979; 2refs
Sponsored by Transport and Road Res. Lab. (England).
Availability: See publication

HS-026 227

WHERE HAVE WE BEEN--WHERE ARE WE GOING? [HUMAN FACTORS ENGINEERING, TRANSPORTATION SYSTEMS]

A review is made of some of the progress in recent years in the transportation field by behavioral scientists and human factors engineers. Improvement in public transportation systems is discussed, especially aids for the elderly and handicapped and research being carried out on automated guideways or people movers. Efforts continue to increase railway safety through better grade-crossing design, more efficient cab design for the freight engine, and use of microcomputer-based display aids. Improvement of visibility and effectiveness for highway directional signs is being sought, as well as better illumination for roadways. A discussion of personal transportation systems covers restraint systems, emphasizing the importance of safety belts and of legislative and educational programs to further their use; problems connected with headlighting and rear lighting; the design of instruments and controls with standardized locations and symbols; and visibility afforded the driver by the vehicle design. Licensing of moped and motorcycle drivers is considered, with the effectiveness of "lights-on" laws and of safety education as accident countermeasures. Potential improvement in the ride quality of heavy commercial vehicles is suggested. Behavioral changes result from energy conservation programs such as the good effect of the 55 mph speed limit. Questions relating to elderly or medically impaired drivers are receiving more attention. Two reliable accident data systems are helping to evaluate many problems: the National Accident Sampling System and the Fatal Accident Reporting System. Computer technology will aid with models such as the Driver-Vehicle Effectiveness Model to simulate driver performance.

by Robert M. Nicholson
National Hwy. Traffic Safety Administration, Washington, D.C. 20590
Rept. No. SAE-790011; 1979; 19p 72refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 228

STATE LAWS AND REGULATIONS ON TRUCK SIZE AND WEIGHT

Research and recommendations are presented concerning the present nonuniformity in state laws relating to motor vehicle sizes and weights. This nonuniformity is estimated to cost the American public between \$1.6 and \$2.8 billion annually and results in the unnecessary use of 400 to 875 million gallons of vehicle fuel. Recommendations are made for increasing the size and weight limits in some states to allow significant benefits from a greater degree of interstate uniformity. The costs and nature of optimal uniformity, and problems in achieving it, are discussed. The estimated costs of standardization, \$2 billion on a one-time basis, will be offset by an estimated annual savings of over \$2.6 billion. Basic recommendations include the adoption by all states of uniform provisions: allow double trailer combinations with 40-ft (12.19-m) trailers, so-called turnpike twin and triple combinations with 28-ft (8.54-m) trailers to operate on all controlled-access highways throughout the country, with access permitted to terminals within a reasonable distance; bring the maximum axle load provisions of all states with lesser limits to the American Assoc. of State Hwy. and Transportation Officials recommended limits of 20,000 lb (9.07 t) single and 34,000 lb (15.42 t) tandem; retain the bridge formula as commonly applied, but eliminate unnecessarily restrictive gross weight

limits. Appended are a bibliography, truckers' questionnaires, a state questionnaire, a commodity flow model, uniformity impact analysis procedure, and a sample multistate agreement.

R. J. Hansen Associates; Inc., Rockville, Md.
Rept. No. NCHRP-198; 1979; 126p refs
Sponsored by American Assoc. of State Hwy. and
Transportation Officials in cooperation with Federal Hwy.
Administration.
Availability: TRB \$7.20

HS-026 229

THE EFFECT OF MOTORCYCLE HELMETS ON HEARING AND THE DETECTION OF WARNING SIGNALS

Measurements of the at-ear helmet-generated aerodynamic noise and helmet transmission loss were carried out for the two major types of motorcycle helmets. From this data and existing information on noise generation by flow around a bare head it was found that for quiet motorcycles at typical speeds the majority of the rider's at-ear noise is generated by the air flow. An assessment of the possibility of hearing damage was then carried out; it was found that only with extremely high usage would there be a significant risk of hearing damage for either the bare-headed or helmeted rider. Helmets did, however, give significant protection. Detection of warning signals was then considered. It was found that under no conditions did the helmet put its wearer at a disadvantage to the bare-headed rider and that at typical speeds the helmet gives a considerable advantage in the detection of warning signals.

by William K. Van Moorhem; K. P. Shepherd; Tom D. Magleby; Guy E. Torian
University of Utah, Dept. of Mechanical and Industrial
Engineering, Salt Lake City, Utah 84112
Rept. No. UTEC-77-010; 1977?; 26p 10refs
Availability: Corporate author

HS-026 230

AN EVALUATION OF ADULT CLASPING STRENGTH FOR RESTRAINING LAP-HELD INFANTS

Quasi-static and dynamic pull tests were conducted to measure the maximum forces that adults can voluntarily exert in holding a 7.9 kg infant dummy (age 6 months) in their laps. The results indicate that the forces that lap and shoulder belted adults can exert in holding an infant dummy in their laps are far less than the inertial force that would be exerted by a 7.9 kg infant decelerated at more than 30 G's. Thus in a motor vehicle frontal barrier crash at 50 km/hr, an infant even when held tightly by a restrained adult would almost certainly strike the dash or windshield. Similarly in airplanes, in crash or turbulence situations, the lap-held infant is likely to hit nearby hard structures. The results clearly demonstrate that it is not safe for infants to be transported in adults' laps in automobiles or airplanes even in the relatively rare instances that they are held tightly and the adults are restrained.

by Dinesh Mohan; Lawrence W. Schneider
Insurance Inst. for Hwy. Safety, Res. Dept., Watergate 600,
Washington, D.C. 20037; University of Michigan, Hwy. Safety
Res. Inst., Biomedical Dept., Ann Arbor, Mich.
1978; 29p 12refs
To be published in Human Factors.
Availability: Insurance Inst. for Hwy. Safety, Watergate 600,
Washington, D.C. 20037

HS-026 231

MOPED SAFETY: PROGRAM DEVELOPMENT AND RESEARCH BY THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

The current and proposed efforts of the Administration to assess the scope and nature of the moped safety problem are described, and the form and direction of the developing moped safety program are outlined. Data obtained on moped use in Europe indicate that the distribution of overall injury for motorcyclists and moped drivers is almost identical, and that the same safety criteria, especially the wearing of helmets, should be applied to both. In 1974, the U.S. Federal safety standards applicable to mopeds were amended to ease requirements, and recent legislation adopted by the States fails to provide adequate regulatory safeguards for moped riders and the public. The Administration's moped safety activities include research being done to assess the scope and nature of the accident problem as well as activities leading to the development of appropriate accident countermeasures. These include studies at the Univ. of Calif., the Univ. of N.C., Systems Technology, Inc., and the Bureau of the Census, the Univ. of Mich., and the National Committee on Traffic Laws and Ordinances. Recommendations being considered will cover: a uniform moped definition; registration and licensing; accident records in which mopeds can be clearly identified; insurance and financial responsibility requirements; operator license, minimum age, and test requirements; traffic law enforcement; moped operator education; public education and information; passengers; use on high-speed roadways; use of on-road bicycle facilities and bicycle paths; use of safety helmets; and rider conspicuity.

by Lewis S. Buchanan
National Hwy. Traffic Safety Administration, Washington, D.C. 20590
1978; 8p 5refs
Presented at 1st Annual Moped Conference, Anaheim, Calif., 11 May 1978.
Availability: Corporate author

HS-026 232

MOPEDS: A CALCULATED RISK

Although fuel efficient, mopeds involve a risk of serious injury and death much greater than automobiles. According to European data, the death rate is 51 per 100,000 vehicles, or about six times higher than the bicycle rate and three times lower than the motorcycle rate. In an effort to assess moped accident potential accurately, a number of studies have been undertaken. A Bureau of Census survey of personal transportation modes in the U.S. includes a motorized bicycle category to obtain demographic data on moped users with information on frequency and type of use, mileage, purpose of travel and vehicle ownership. A study of accident avoidance capabilities of motorized bicycles includes evaluation of the acceleration, braking, handling, and stability characteristics, to determine whether additional Federal safety standards applicable to accident avoidance are needed. A mathematical model will be developed to make a 10-year forecast of the potential use of motorized bicycles (and of accidents); variables will include sales volumes, mileage, patterns of use, and crash rates. The motorcycle multidisciplinary accident investigation team at the Univ. of Southern Calif. will investigate and analyze moped accidents. The easing of requirements for moped use may be premature; more adequate accident and registration data are needed.

HS-026 233

by Lewis S. Buchanan
National Hwy. Traffic Safety Administration, Traffic Safety
Programs, Washington, D.C. 20590
Publ: National Highway Safety Newsletter (Sep 1977)
1977; 2p
Availability: See publication

HS-026 233

LIGHTING COLUMNS: RESEARCH ON THE BEHAVIOUR OF LIGHTING IN SIDEWAYS-ON AND HEAD-ON IMPACT TESTS WITH PRIVATE CARS

Series of impact tests were conducted to examine the behavior of lighting columns in sideways or head-on impacts by private cars. The resistance met with by the vehicle in hitting the column, the denting of the passenger's compartment, location of the columns after the impact, and the influence of the electric current during and after the impact were investigated. Three series of tests were carried out. It was found that a car meets little resistance from the column if the shaft is easily separated from the root section at about ground level. This is attainable by providing the columns with a special safety design or by making them break at the base by utilising the material properties of aluminum. The slip design, developed so the column could separate from the root section in an impact under controlled conditions, consists of a flange welded on to the bottom of the column which is connected with three bolts to the flange on the root section; the bolts are in V-shaped slots so that the flanges can separate. The root section flange should be about 3 cm above the ground. The design and execution of the testing program are described and the test results detailed; photographs and tables are provided.

by C. C. Schoon, comp.; A. Edelman, comp.
Institute for Road Safety Res. (SWOV), P.O. Box 71, 2270 AB
Voorburg, Netherlands
Rept. No. SWOV-Pub-1978-2E; 1978; 57p 25refs
Availability: Corporate author

HS-026 234

HAZARDS WITH FALLING LIGHTING COLUMNS: CONSIDERATIONS REGARDING THE POSITIONING OF LIGHTING COLUMNS LOW- AGGRESSIVE FOR PRIVATE CARS

Impact tests by SWOV in 1978 have demonstrated that the hazard for car occupants in a collision with a rigid lighting column is reduced if the column is designed to break off at the base or slip off from its foundations. The column can still be dangerous if it strikes road users while falling or if it falls on the road and is hit by other vehicles or leads to sudden evasive action. To indicate where an impacted lighting column is liable to fall on the road, data on 'lighting columns low-aggressive for private cars' are used, originating from impact tests with 10 and 12-m columns. Fatal car and moped accidents involving lighting columns are classified according to area, time and location on the highway. On the basis of data collected from 1968-72, the implications of erecting low-aggressive columns (and of impacts with them) are indicated for various types of roads and intersections.

by C. C. Schoon, comp.; A. Edelman, comp.
Institute for Road Safety Res. (SWOV), P.O. Box 71, 2270 AB
Voorburg, Netherlands
Rept. No. SWOV-Pub-1978-3E; 1978; 28p 15refs
Availability: Corporate author

HSL sb-39

HS-026 235

AUTOMOTIVE SENSORS

Eight papers separately discuss the following topics concerning automotive sensors: an alternative approach to automotive fuel gauging; cylinder pressure sensor for spark advance control and knock detection; titania exhaust gas sensor; design/production of automotive sensors; characteristics of ZrO₂-type oxygen sensors; ratiometric temperature sensor; new temperature sensor; and new Wiegand distributor with in-bowl electronic advance.

Society of Automotive Engineers, Inc., 400 Commonwealth
Drive, Warrendale, Pa. 15096
Rept. No. SAE-SP-441; 1979; 62p refs
Includes HS-026 236--HS-026 243. Presented at Congress and
Exposition, Detroit, 26 Feb-2 Mar 1979.
Availability: SAE

HS-026 236

AN ALTERNATIVE APPROACH TO AUTOMOTIVE FUEL GAUGING

The capacitance-measuring technique used for aircraft fuel tanks has been applied to the development of an accurate, high-resolution automobile fuel gauge. An inexpensive probe is described which can be used, with suitable circuitry, to give a 0.1 gal accuracy and resolution, from which the influence of slosh and tilt is effectively eliminated. A low-cost measuring circuit is described, based on CMOS astable oscillators, which produces digital readings virtually immune to noise, voltage and temperature changes, and the effects of aging. The great advantage of this fuel gauge lies in the inexpensiveness and utility of its probe and associated oscillators. Since all the calibration is carried out in the probe unit, the dashboard signal-processing circuitry and/or display can be time-shared with any other measured parameter which may cause a change in resistance, capacitance, or inductance, for minimal extra cost.

by John Huddart
Oxford Univ., Dept. of Engineering Science, England
Publ: HS-026 235 (SAE-SP-441), "Automotive Sensors,"
Warrendale, Pa., 1979 p1-7
Rept. No. SAE-790138; 1979; 9refs
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar
1979.
Availability: In HS-026 235

HS-026 237

A CYLINDER PRESSURE SENSOR FOR SPARK ADVANCE CONTROL AND KNOCK DETECTION

A potentially inexpensive, piezoelectric cylinder pressure transducer, called the PZT, has been built and tested. The transducer, in the shape of a washer, is torqued down under the spark plug. It generates an open circuit voltage proportional to the cylinder pressure. The cylinder pressure causes fluctuating stresses in the piezoelectric ceramic. These stress variations produce a voltage through a coupling between mechanical and electrical energy. Results from the transducer testing confirm the expectation that the electrical output signal could be used for closed-loop control of spark advance by positioning the peak cylinder pressure where desired during the power stroke of the engine. The bandwidth of the transducer is sufficiently wide so that high-frequency cylinder pressure oscillations corresponding to engine detonation can be detected and used in a knock-adaptive spark-timing device. The design of the transducer is compatible with mass-production techniques, and it is anticipat-

ed that material costs would not be a major deterrent to a mass-production sensor.

by Kent W. Randall; J. David Powell
Systems Control, Inc.; Stanford Univ.
Publ: HS-026 235 (SAE-SP-441), "Automotive Sensors,"
Warrendale, Pa., 1979 p9-18
Rept. No. SAE-790139; 1979; 3refs
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar
1979. See also HS-026 191.
Availability: In HS-026 235

HS-026 238

TITANIA EXHAUST GAS SENSOR FOR AUTOMOTIVE APPLICATIONS

A titania (titanium dioxide, TiO₂) exhaust gas sensor for closed-loop emission control systems has been developed and tested. The sensor is a temperature-compensated, dual TiO₂ element device rapidly responsive to the large excursions in exhaust gas oxygen partial pressure with engine air-fuel ratio passage through the stoichiometric mixture. Material properties, sensor components and performance characteristics of TiO₂ are described. Results of engine dynamometer and vehicle tests of this pilot production model's performance and durability demonstrate the suitability of the sensor for closed-loop control applications.

by M. J. Esper; E. M. Logothetis; J. C. Chu
Ford Motor Co.
Publ: HS-026 235 (SAE-SP-441), "Automotive Sensors,"
Warrendale, Pa., 1979 p19-27
Rept. No. SAE-790140; 1979; 18refs
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar
1979.
Availability: In HS-026 235

HS-026 239

AUTOMOTIVE SENSORS; DESIGN/PRODUCTION

High-quality, low-cost automotive sensors are the key to precise electronic engine control for reducing emissions and fuel consumption. An outline is presented of the design approach, test procedures, production processes, and quality-assurance measures required to be a successful high-volume supplier of automotive sensors. Four typical automotive sensors are discussed: a temperature sensor, a linear position sensor, a rotary position sensor, and a magnetic crankshaft position sensor.

by F. A. Russo; B. E. Walker
Bendix Corp., EECSG
Publ: HS-026 235 (SAE-SP-441), "Automotive Sensors,"
Warrendale, Pa., 1979 p29-34
Rept. No. SAE-790141; 1979
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar
1979.
Availability: In HS-026 235

HS-026 240

CHARACTERISTICS OF ZrO₂ [ZIRCONIA]-TYPE OXYGEN SENSORS FOR AUTOMOTIVE APPLICATIONS

Using ZrO₂ (zirconium dioxide, or zirconia)-type exhaust gas oxygen sensors for closed-loop emission control systems, tests were conducted on new sensors, sensors tested in dynamometers and road vehicles, and lead-poisoned sensors to determine their

performance in terms of voltage output, switching response, internal resistance, and voltage-lambda switching behavior. New sensors behaved as ideal sensors at temperatures above 400 degrees C, and behaved nonideally at temperatures below 350 degrees C. Sensors subjected to dynamometer and vehicle tests showed a gradual degradation in output voltage and steepness of their voltage-lambda switch. Their internal resistances and lean-to-rich switching times increased with use, while the rich-to-lean switching times decreased. Self-recovery of a sensor from lead poisoning occurred during subsequent vehicle operation with lead-free fuel.

by C. T. Young; J. D. Bode
Bendix Corp., Bendix Res. Labs., Southfield, Mich.
Publ: HS-026 235 (SAE-SP-441), "Automotive Sensors,"
Warrendale, Pa., 1979 p35-44
Rept. No. SAE-790143; 1979; 20refs
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar
1979.
Availability: In HS-026 235

HS-026 241

A RATIOMETRIC TEMPERATURE SENSOR [ENGINE INTAKE MANIFOLD FUEL/AIR CHARGE]

A new type of ratiometric temperature sensor has been developed which closely tracks the rapidly fluctuating temperature of the fuel/air charge in an engine's intake manifold. Among the improvements effected over conventional sensors are linear output, high output DC voltage, high convection/conduction heat-flow ratio, and relatively quick response. The device consists of a RESISTOFILM conductive plastic potentiometer, driven by an integral bimetallic sensing element. The ratiometric temperature sensor provides a linear ratiometric output voltage ranging from 15% to 85% of the total supply voltage over the sensed temperature range of -40 degrees C to plus 125 degrees C. Output accuracy is plus/minus 3 degrees C over a temperature range of plus 20 degrees C to plus 100 degrees C.

by Peter J. Sacchetti
New England Instrument Co., Res. and Devel. Dept., Natick, Mass.
Publ: HS-026 235 (SAE-SP-441), "Automotive Sensors,"
Warrendale, Pa., 1979 p45-51
Rept. No. SAE-790144; 1979; 4refs
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar
1979.
Availability: In HS-026 235

HS-026 242

A NEW TEMPERATURE SENSOR [AUTOMOTIVE APPLICATIONS]

A new technology (Alphamet) for automotive temperature sensors has been developed which offers a product which is extremely rugged, capable of withstanding the most rigorous environments, and is expected to result in very inexpensive manufacture. The construction of the temperature sensor, a hybrid circuit on a porcelain-clad steel substrate, is inherently less expensive than either printed wiring boards or alumina substrates. The key cost factors are the tooling required to stamp the part and the volume of the run over which it is to be amortized. The resistors are also inexpensive to fabricate. Packaging of the product is typically by epoxy molding into a threaded metal fitting, which is also inexpensive.

by Robert N. Lesnick; Murray Spector
Alpha Advanced Technology, Inc.
Publ: HS-026 235 (SAE-SP-441), "Automotive Sensors,"
Warrendale, Pa., 1979 p53-5
Rept. No. SAE-790145; 1979
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar
1979.
Availability: In HS-026 235

HS-026 243

A NEW WIEGAND DISTRIBUTOR WITH IN-BOWL ELECTRONIC ADVANCE

The Wiegand Effect, a new magnetic pulse-generating technology requiring no electrical input, has been applied as an ignition trigger for an inductive ignition system, providing constant angular dwell. The magnetic circuit has been designed to permit easy application in conventional automotive distributors, and is not affected by the axial end-play characteristic in such distributors. The electronic circuitry for this distributor includes a unique electronic advance circuit replacing the conventional mechanical centrifugal advance. This circuit provides great accuracy and flexibility in controlling and shaping the advance curve. All of the electronics, including the power drive to the ignition coil, are incorporated within the distributor bowl. The distributor is particularly suited for marine and stationary engines, racing vehicles, and other systems not employing a vacuum or load signal. This work is an outgrowth of earlier research in which the Wiegand Effect was introduced as the distributor trigger in a capacitive discharge ignition system for high-performance applications. Compared to other contactless systems, the Wiegand trigger offers inherently higher reliability, resistance to environmental conditions (temperature), consistent output at any rotational speed, and provision for simplified electronics.

by J. David Marks; Michael J. Sinko
Echlin Mfg. Co.
Publ: HS-026 235 (SAE-SP-441), "Automotive Sensors,"
Warrendale, Pa., 1979 p57-61
Rept. No. SAE-790148; 1979; 3refs
Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar
1979.
Availability: In HS-026 235

HS-026 244

STREETS FOR PEDESTRIANS AND TRANSIT: AN EVALUATION OF THREE TRANSIT MALLS IN THE UNITED STATES. FINAL REPORT

Benefits and disadvantages are quantified of three out of six major transit malls described in Phase 1 of a project to acquaint city planners with transit malls. The locations analyzed include Nicollet Mall in Minneapolis, Chestnut Street Transitway in Philadelphia, and Portland Mall in Portland, Oregon. An analysis is made of the following items: maintenance and construction costs; transit service improvements, including bus speed and reliability, coverage, capacity, ridership, productivity, and system understandability; the level of service provided pedestrians and waiting transit patrons; environmental impacts; pedestrian and bicyclist safety; traffic diversion; parking; goods delivery; enforcement; and economic impacts. From the analysis, it is concluded that transit malls are inexpensive improvements. In Philadelphia and Portland, responsibility for maintenance is divided among property owners, city agencies, and the transit authority. Overall bus trip time has not decreased in Minneapolis or Philadelphia; Portland reports a 50% reduction. Contra-

flow bus lanes in Minneapolis have shorter trip times than either the parallel transit mall or an unimproved comparison street. Transit malls may increase the physical capacity for buses. Pedestrian convenience is improved by benches, and ease of circulation by ramps and midblock crossings. Bus shelters provide protection from weather, and sometimes seating and transit information. Air pollution and noise levels appear lower on Philadelphia and Minneapolis malls; in Portland, nitrogen dioxide bus fumes and noise are up, carbon monoxide down. There was no apparent overall reduction in pedestrian injuries/fatalities, but a sharp decrease for nonpedestrian accidents. General traffic was diverted easily. Goods delivery was least interrupted where rear alleys were used. Existing parking facilities absorbed losses in on-street spaces. There are few violations of buses-only blocks. Mall construction reduced business in Philadelphia and Portland, but not as much as expected. There was no overall increase in retail sales, at least in Philadelphia or Minneapolis, but secondary economic indicators are positive.

by Richard Edminster; David Koffman
Crain and Associates, 1145 Merrill St., Menlo Park, Calif. 94025
DOT-TSC-1081
Rept. No. UMTA-MA-06-0049-79-1; DOT-TSC-UMTA-79-7;
1979; 259p 35refs
Rept. for Apr 1977-Dec 1978. Urban Mass Transportation
Administration Service and Methods Demonstration Prog.
UMTA/TSC Proj. Evaluation Series. See also UMTA-MA-06-
0049-77-11.
Availability: NTIS

HS-026 245

BEATING THE MASS MERCHANDISERS AT THE BRAKE GAME

Advice is given to the independent automotive brake specialist on attracting customers and dealing with competing mass merchandisers who offer substantially lower prices. It is pointed out that the mass merchandisers run big ads, making offers that attract the interest of the consumer, advertising a low price for part of the job in order to get the car into the shop. Once the customer signs up for the low-priced special, he becomes the target of a very high pressure selling campaign. Generally, the mass merchandiser mechanic finds some problem and inflates the job by explaining all the dangerous conditions he has found, resulting in a bill equal to or more than most independents would charge for the same job. Most car owners would prefer to have a good brake job done by someone they can talk to and have confidence in. It is helpful for the independent mechanic to explain how his approach differs from that of the mass merchandiser. He should discuss brakes with every customer, to firmly impress the car owner with his expertise. One effective way to breed customer confidence is for the mechanic to keep up with all the latest technical information (needed to pass the NIASE certification test in brakes). Advertising (preferably by direct mail) offering specials, and accepting credit cards are other methods of attracting business. It is suggested that if a person is interested in operating a brake-only business, he should consider a franchise, either a drive-in or a mobile shop. Suggestions for independent brake repairers (franchise information, service manuals, parts) are offered in a separate section.

by Bob Cerullo
Publ: Motor v151 n5 p46-7, 50-2, 55, 59, 106 (May 1979)
1979; 1ref
Availability: See publication

HS-026 246

DRUGS (OTHER THAN OR IN ADDITION TO ETHYL ALCOHOL) AND DRIVING BEHAVIOR: A COLLABORATIVE STUDY OF THE CALIFORNIA ASSOCIATION OF TOXICOLOGISTS

In response to a request by the California Hwy. Patrol for information on the state of the art of drug testing and interpretation in drugs-and-driving situations, many members of the California Assoc. of Toxicologists compiled comprehensive data on a sample group of 765 subjects in whom one or more psychoactive drugs, other than or in addition to alcohol, had been found and in whom a driving behavior problem had been documented. The study showed that the presence of these drugs in persons with driving behavior problems causes major objective alterations in sensory-motor capabilities, such as impaired balance and coordination, slurred speed, and staggering. Serious observed driving behavior problems, such as weaving, driving without due care, and accidents, were common in this group. The typical subject was a white male under the age of 30. Correlation between reported alcohol odor and positive blood alcohol with regard to sensitivity and specificity was poor, with nearly 50% false positives and 50% false negatives. The most commonly identified drugs were a variety of barbiturates, diazepam, methaqualone, chlordiazepoxide, meprobamate, and ethchlorvynol. More than half of the time, when one drug was found, at least one other drug (including alcohol) was also present. The arresting officer's ability to predict correctly which drug the suspect had taken was approximately 50%, based on his own suspicion or on the discovery of a drug in the subject's possession. The presence of a detectable drug was statistically associated with accidents at a highly significant range in comparison with a control group. Females were statistically more likely to have accidents, including fatal accidents, than males at a significant blood drug level. The addition of alcohol to another drug appears significantly to increase the likelihood of a fatal accident.

by G. D. Lundberg; J. M. White; K. I. Hoffman
 Publ: Journal of Forensic Sciences v24 n1 p207-15 (Jan 1979)
 1979; 4refs
 Presented at 28th Annual Meeting of American Acad. of Forensic Sciences, Washington, D.C., Feb 1976.; California Assoc. of Toxicologists Meeting, San Diego, 1976; California Assoc. of Criminologists Meeting, Costa Mesa, Calif., 1976; and Dept. of Forensic Medicine, London Hosp. Medical Coll., London, Dec 1976.
 Availability: See publication

HS-026 247

VEHICLE WEIGHT/HORSEPOWER RATIO AS RELATED TO PASSING LANE DESIGN CRITERIA. FINAL REPORT

A review is presented of the current American Assoc. of State Hwy. and Transportation Officials procedure for design of passing lanes on highway grades. Published and unpublished data on engine and vehicle performance characteristics were evaluated to determine representative design vehicles. The values recommended for use in the current design procedure for allowable speed reduction on a grade and entry speed at the bottom of a grade were evaluated through an examination of available information. A representative truck and a recreational vehicle (RV) were identified and their performance characteristics determined via computer simulation. Design curves and charts were prepared from the simulation results. It is recommended that the weight-to-power ratio of the representative truck for design be changed from 400 lb/hp (243.3 kg/kW) to 300 lb/hp (182.5 kg/

kW) and that the weight-to-power ratio of a representative RV for design be 60 lb/hp (36.5 kg/kW). It is also recommended that all design curves be based on an entry speed of 55 mph (88.5 kph) and that normal speed reduction for design be reduced from 15 mph (24.1 kph) to 10 mph (16.1 kph).

by Gordon F. Hayhoe; Jack G. Grundmann
 Pennsylvania State Univ., Pennsylvania Transportation Inst., University Park, Pa.
 Rept. No. PTI-7806; 1978; 61p 13refs
 Report on Proj. PTI 7788, NCHRP-20-7-Task 10. Sponsored by American Assoc. of State Hwy. and Transportation Officials, in cooperation with Federal Hwy. Administration, and conducted in the National Cooperative Hwy. Res. Prog.
 Availability: Corporate author

HS-026 248

PERIPHERAL VISION AND DRIVING

The importance of information from the visual periphery in ordinary driving maneuvers was examined using subjects whose vision was restricted to a 15 degrees conical volume around the visual axis, and who drove an instrumented car equipped to record lateral deviations from a standard path and the time between successive points of travel. Two runs were made on the test course (long straight; long left curve, increasing radius; straight section with lane change; sharp S-curve, right then left; short left curve) with the subjects wearing a helmet to restrict peripheral vision, after four to six runs were made without the helmet (open vision). The mean values of eight trials (four with and four without restrictions) for five subjects show essentially no change in total time across trials. Helmet vs. open vision also failed to show any difference in terms of total circuit times. It appears that segment time or speed is not influenced systematically by the presence or lack of the visual field restriction. The speed variability by segment remains to be examined. The mean tracking error (position) and standard deviations for each track segment were calculated for each run of each subject. The variability of tracking errors is a better indication of the difficulty in following the prescribed path. After more data are analyzed, results of the study will be discussed further.

by Richard A. Olsen
 Pennsylvania State Univ., Pennsylvania Transportation Inst., Human Factors Res. Prog., Res. Bldg. B, University Park, Pa. 16802
 1978; 34p 25refs
 Sponsored by National Swedish Road and Traffic Res. Inst. (VTI).
 Availability: Corporate author

HS-026 249

SAFETY EFFECTIVENESS EVALUATION OF THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION'S PASSIVE RESTRAINT EVALUATION PROGRAM

Current activities and future plans of the National Hwy. Traffic Safety Administration (NHTSA) were assessed in its evaluation of the passive restraint standard, Federal Motor Vehicle Safety Standard 208 (as amended 5 Jul 1977). It is concluded that NHTSA must evaluate the real-world effectiveness of the passive restraint standard, and that the current evaluation program is unorganized. An evaluation program plan is required to coordinate effectively the evaluation activities and to address the complexities of this task. The present contract study to develop an evaluation plan for the period up to the effective date of the standard, 1 Sep 1981, appears limited in scope to gross measures

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of effectiveness, and NHTSA has no evaluation plan documented or under development to cover the period after 1 Sep 1981. The effectiveness of the evaluation program will be improved by providing for public comment on the proposed evaluation plan. It is recommended that NHTSA develop a formal evaluation plan, to be published for public comment by 1 Oct 1979.

National Transportation Safety Board, Office of the Managing Director, Washington, D.C. 20594
Rept. No. NTSB-SEE-79-3; 1979; 16p 3refs
Availability: NTIS

HS-026 250

THE MINDLESS PURSUIT OF SAFETY [PRODUCT RECALLS]

The cost and effectiveness of product recalls are examined, as carried out by such Federal regulatory agencies as the National Hwy. Traffic Safety Administration, the Environmental Protection Agency, the Consumer Product Safety Commission, and the Food and Drug Administration. It is felt that the courts are regularly interpreting the law to hold manufacturers liable for large sums when their products are connected with injury to someone. Emphasis during product liability litigation is not on who is responsible but who is best able to pay. Agencies and courts are seen as accepting the appearance rather than the reality of social benefit and bringing about an uneconomic allocation of risk, shifting too much away from the consumer and back upon the manufacturer. It is admitted that cost/benefit ratios are complicated in the consumer safety field, especially when they concern suffering or death. Consumer error or recklessness is seen as the cause of the overwhelming number of product-connected injuries. As the trend towards more recalls and liability increases, manufacturers will do more testing to make safer products and will take out plenty of liability insurance, resulting in higher prices. The beneficiaries will be the reckless, who will be guaranteed compensation for injuries. Buyers and sellers, it is emphasized, should share more equitably the total costs of accidents; today, the transfer of more incentive to the manufacturer to make products safer is seen as going too far.

by Walter Guzzardi, Jr.
Publ: Fortune p54-6, 58, 60, 62, 64 (9 Apr 1979)
1979
Availability: See publication

HS-026 251

GASEOUS EMISSIONS FROM UNREGULATED MOBILE SOURCES

The impact of gaseous exhaust emissions (total hydrocarbons, carbon monoxide, and nitrogen oxides) was determined for the following categories of mobile sources which are not currently covered by national emission regulations: farm equipment, merchant vessels, locomotives, lawn and garden implements, snowmobiles, outboard motors, transport refrigeration units, and helicopters. Mass emission rates of each category are tabulated and compared to other emissions from both mobile and stationary sources in selected Air Quality Control Regions (AQCR). Projections are given of the expected increase of emissions from each source category through 1990. Results show that in the near future some categories of mobile sources will be contributing substantial amounts of pollutants, on a mass basis, in regions with critical air pollution problems. As stricter emission standards on regulated sources continue to be implemented, the relative significance of these unregulated sources will increase. The

major conclusion is that broad generalizations about the amounts of air pollution contributed by these unregulated mobile sources nationwide may be grossly misleading. The only effective way to assess their impact is seen to be on a region-by-region basis. To this end, generalized computer programs were developed which permit the estimation of each category's present and future mass emission rates in any AQCR in the U.S.

by Donald E. Zinger; Lawrence H. Hecker
EPA-R-803568-01-0
Publ: Journal of Air Pollution Control Association v29 n5 p526-31 (May 1979)
1979; 3refs
Availability: See publication

HS-026 252

SUICIDE, MOTOR VEHICLE FATALITIES, AND THE MASS MEDIA: EVIDENCE TOWARD A THEORY OF SUGGESTION

Statistical analyses of California data on fatal motor vehicle accidents and newspaper stories covering suicides strongly indicate a previously unsuspected, real-world effect of imitation, suggestion, and modeling on drivers. It is shown that motor vehicle accident fatalities increase markedly just after publicized suicide stories. The increase occurs only after the story is publicized, varies directly with the amount of publicity, and occurs mainly in the area where the suicide story is publicized. Single vehicle crashes increase more than other types just after suicide stories. Suicide stories about young persons tend to be followed by single-vehicle crashes involving young drivers; stories about older persons tend to be followed by older-driver involvement in single-vehicle crashes. Stories about murder and suicide tend to be followed by multiple-vehicle crashes involving passenger deaths, while stories about suicide alone tend to be followed by single-vehicle crashes involving driver deaths. The possible usefulness of the concepts of suggestion, imitation, and modeling in behavioral decision theory, reference group theory, and the theory of anomie and its effects is examined.

by David P. Phillips
R-64
Publ: American Journal of Sociology v84 n5 p1150-74 (Mar 1979)
1979; 73refs
Sponsored by University of California Regents.
Availability: See publication

HS-026 253

A RECORD YEAR FOR RECALLS [PRODUCT SAFETY]

An overview is presented of the product recall process carried out by the four major watchdog agencies with recall power (Food and Drug Administration, National Hwy. Traffic Safety Administration (NHTSA), Environmental Protection Agency, and Consumer Products Safety Commission), especially recalls in 1978, a record year. A roster is included of representative recalls (except for automotive products) in 1978 (product, manufacturer, units recalled), as well as a tabulation comparing the number of recall campaigns (and product units recalled) for 1973 vs. 1978 for the four Federal agencies. In 1978, more than 50 million products, from foods, drugs, and cosmetics to automobiles, appliances, and toys, were recalled by their manufacturers, either voluntarily or under pressure from one of the agencies empowered to police the marketplace for dangerous defective products. The automakers processed more than 2

different safety and emission-related recalls, involving about 14 million cars. NHTSA says that the reason for the large increase in recalls since 1973 is the increase in agencies' consumer-complaint activities and the trend to commonality of parts, especially in the auto industry. This trend means that a fault in one model run also may turn up in another. Despite the proliferation of recalls, U.S. products are safer and of better quality than five years ago, according to a Conference Board safety expert. The prospect for 1979, however, is for an even larger recall year. One expert predicts that over the next five years the number of recalls will not only grow at an annual rate of 10% to 15%, but that all automakers and perhaps half the manufacturers of TV sets and electric appliances will recall at least some of their products.

by Robert Levy; Mark Levenson
 Publ: Dun's Review v113 n1 p28-34 (Jan 1979)
 1979
 Availability: See publication

HS-026 254

ELECTRIC AND HYBRID VEHICLE PROGRAM. THE SECOND ANNUAL REPORT TO CONGRESS FOR FISCAL YEAR 1978

Results of work conducted in fiscal year 1978 to satisfy the requirements of the Electric and Hybrid Vehicle Res., Devel., and Demonstration Act of 1976 (Public Law 94-413), as amended by P.L. 95-238, are reported, as well as the Dept. of Energy's approach to the management, administration, and coordination of the projects required for implementation of the Electric and Hybrid Vehicle (EHV) Prog. Also presented are notable results of studies, evaluations, and assessments. EHV Prog. background and organization, demonstrations, incentives, research and development, and other activities (state-of-the-art assessment, opportunity and risk assessment, impact assessments, and environmental impact evaluation process) are discussed separately. Appended are tabulated information on EHV Prog. contracts and agreements, and a list of fiscal year 1978 publications, reports, and brochures related to the EHV Prog.

Department of Energy, Office of Electric and Hybrid Vehicle Systems, Washington, D.C. 20585
 Rept. No. DOE/CS-0068; 1979; 91p refs
 Availability: NTIS \$6.00 printed copy, \$3.00 microfiche; GPO, stock no. 061-000-00275-8

HS-026 255

FUEL SAVINGS FROM TRUCK AERODYNAMIC DRAG REDUCERS AND CORRELATION WITH WIND-TUNNEL DATA

A 9347 km (5809 mi) cross-country (mainly on Interstate highways from College Park, Md. to San Diego, Calif. and back) fuel economy experiment was conducted to demonstrate typical fuel savings that can be obtained using drag-reducing devices on tractor-trailer trucks, and to ascertain the degree of correlation of the field experiment fuel savings with the fuel savings that could be predicted using data from drag-reduction experiments on models in a wind tunnel. One of three trucks used was equipped with a commercially-available wind deflector/vortex stabilizer system, another was equipped with a prototype streamline fairing/gap seal system developed at the Univ. of Maryland, and the remaining vehicle was operated without any drag-reducing devices. The fuel savings per unit distance that resulted from use of the commercial drag-reducing system was 0.029 plus/minus .006 1/km (0.012 plus/minus .002 gal/mi),

while that realized with the Univ. of Maryland prototype system was 0.057 plus/minus .003 1/km (0.024 plus/minus .001 gal/mi). These results are considered conservative estimates of long-term savings. Fuel savings predictions were performed using wind-tunnel drag-reduction data, and relative airspeed and yaw-angle data which were measured continuously in the fuel economy experiments. The measured fuel savings for the commercial system was 75 plus/minus 15% of the predicted value, and for the Univ. of Maryland system, 78 plus/minus 4%. The differences appear related to the absence of a wind turbulence factor in the wind-tunnel experiments.

by Frank T. Buckley, Jr.; William H. Walston, Jr.; Colin H. Marks
 NSF-SIA74-14843
 Publ: Journal of Energy v2 n6 p321-9 (Nov-Dec 1978)
 1978; 14refs
 Availability: See publication

HS-026 256

DEER ON THE HIGHWAY

From 1972 through 1976, motor vehicle-deer collisions in Michigan increased 44% from 9960 to 14,350 (total collisions 63,184). In 93.7% of the accidents, a vehicle simply collided with a deer; the remaining were more complex and usually more serious. Most accidents occurred on unlighted roadways at night, under dry road conditions. The most hazardous roads were "local roads", with 51.8% of total accidents, 65% of personal injuries, and 43% of fatalities. Monthly variations in number of collisions are principally the result of changes in deer activity (increases associated with the rut and changing food supplies). Car-deer kills have continued to escalate in southern Michigan and the northern half of the Lower Peninsula. Although the majority of car-deer collisions result only in property damage, 3446 people have been injured and 17 killed in Michigan in the last five years. One estimate of societal costs had vehicle-deer crashes costing Michigan more than \$25 million in 1975 and 1976. Statistical analysis of the relationship of deer population and traffic volume to accidents in Michigan suggested that car-deer accidents vary proportionately with deer population levels, but vary directly with traffic volumes. It is noted that in early 1974, reduced traffic speeds due to the oil crisis produced the only reversal of the general upward trend of car-deer accidents in Michigan. Warning signs, roadside mirrors to frighten deer, and underpasses for deer to use in migration are not considered useful countermeasures; fencing, though expensive, holds some possibility, as well as recreational hunting in problem areas; fewer vehicles moving at slower speeds offer the greatest possibility for reducing vehicle-deer collisions.

by David A. Arnold
 Publ: Traffic Safety v79 n5 p8-10, 29-30 (May 1979)
 1979; 1ref
 Availability: See publication

HS-026 257

IN VANCOUVER, PASSENGER SAFETY STARTS WITH THE KIDS

The B.C. Hydro Transportation Div., Vancouver, British Columbia (Canada) launched a program in Jan 1977 to educate children in kindergarten through grade 4 on public transit safety. The goal of the Student Transit Prog. is to visit each elementary school in the Greater Vancouver area once every three years. In the program, an instructor, an operator, and a bus visit the school. The instructor opens a classroom session by

stressing the importance of the safe and proper use of the transit system. This is followed by a tape-slide presentation. Following the classroom session, the students are taken to a bus parked in the schoolyard. After showing how to board the bus properly, the operator points out some common hazards, such as riding between the curb and a bus pulling into stops or turning, "horseplay" on vehicles, walking out into traffic from in front of or behind a stopped transit vehicle, throwing items at buses, and failing to use handholds when standing in a moving transit vehicle. The operator then takes the children for a short ride, demonstrating, where feasible, some hazards. At the conclusion, each student receives an inexpensive reminder of the visit (e.g. coloring book, lapel button). After the program was initiated, a symbol was designed to identify the Student Transit Prog.; today, "Mr. Buzzer", a portly and jolly six-foot-plus bus operator, is much in demand for various public events. Community good will and long term public relations value are added benefits of the program.

by Peter F. Gleave
 Publ: Traffic Safety v79 n5 p14-5 (May 1979)
 1979
 Availability: See publication

HS-026 258

TRANSPORTATION SECRETARY ADAMS TAKES DELIVERY OF RSV [RESEARCH SAFETY VEHICLE]

On 26 Mar 1979, Secretary of Transportation Brock Adams accepted delivery of a four-passenger prototype vehicle, built by Minicars, Inc. (Goleta, Calif.) under the National Hwy. Traffic Safety Administration's Res. Safety Vehicle (RSV) Prog. The RSV Program's purpose is to build and test cars with advanced safety features that can be included in production line assembly cars by the mid-1980's. The Minicars RSV has a large interior for comfort, outstanding visibility, "gull-wing" doors for easy access to front and rear seats, and a stratified-charge engine providing an estimated 32 mpg with low emissions. The car has an innovative body composed of foam-filled steel sections for improved energy absorption. Foam-filled structures and doors substantially increase occupant protection without increasing vehicle weight. Soft, flexible bumper, hood, and front fender offer pedestrian protection. An advanced air bag system is included for front seat occupants. Some vehicles delivered later will have run-flat tires. NHTSA contractors are also developing such safety features as antiskid brakes, dashboard electronics digital display for vehicle diagnostics, and an anticollision radar warning and braking system. The final phase of the RSV Prog. will feature vehicle testing and evaluation by domestic and foreign concerns.

Publ: Traffic Safety v79 n5 p18-9 (May 1979)
 1979
 Availability: See publication

HS-026 259

LEFT-TURN-ON-RED: SHOULD IT BE GIVEN THE GREEN LIGHT?

The question is considered whether allowing a left-turn against a red light at traffic signals, having given way to other vehicles and pedestrians, should be introduced in the UK (where vehicles use the left side of the highway). The results of studies in the US for right-turn-on-red are reviewed, and differences between American and British traffic engineering conditions examined. Benefits include savings in time, fuel and emissions; the

increase in accident potential feared by traffic engineers has not been found in the US. It is concluded that, despite less favorable conditions, positive net benefits could be obtained, and that a practical trial is the only sure way to assess the full value of the rule.

by S. T. Atkins
 Publ: Highway Engineer v25 n11 p15-7 (Nov 1978)
 1978; 9refs
 Availability: See publication

HS-026 260

EMERGENCY MEDICAL SERVICES COMMUNICATIONS SYSTEM TECHNICAL PLANNING GUIDE

Guidance is provided for planning Emergency Medical Services (EMS) communications, including processes and procedures and recommendations for obtaining technical, consultative and other assistance in designing and implementing EMS systems. The report is designed to familiarize the non-technical personnel with common communication terms, concepts, and helpful references. Fundamental elements of land-mobile radio are introduced, and details of citizen access and emergency medical responses are addressed. Planning a 911 emergency system is discussed, and the development of an EMS command and control center is highlighted. Frequency-assignment regulations and selected configurations for an EMS system are introduced. Appended are information on FCC licensing and rules and regulations, data gathering forms, a list of acronyms, a glossary, and bibliography.

by Joseph A. Hull; John M. Harman; Marylyn N. Olson; H. David Hunt
 National Telecommunications and Information Administration
 Inst. for Telecommunication Sciences, Boulder, Colo. 80303
 Rept. No. NTIA-SP-79-3; 1979; 208p 64refs
 Availability: Corporate author

HS-026 261

NOISE LEVELS INSIDE PASSENGER CARS

Sound pressure level readings were taken inside five different makes of car running on the streets of the city of Mosul, Iraq. Mercedes-Benz 1976 Saloon 230.4, a Fiat (Italian) 1966 125A Peugeot 1973, a Volkswagen (Beetle) 1968 1600 cc, and a Volkswagen 1975. Condition of the cars varied from "very good" to "reasonable"; they were run at different speeds, both morning and evening, and readings were taken with a sound level meter (E.K.) on the back seat. The Mercedes-Benz was found to be best insulated from outside noise. The problem of noise and vibration produced by cars is reviewed and discussed with reference to the source, its transmission, the range of frequencies and the level of noise in cars. Acceptable levels and methods of noise control are also discussed.

by S. M. J. Ali; S. P. Sarna
 Publ: Applied Acoustics v11 n4 p277-84 (Oct 1978)
 1978; 4refs
 Availability: See publication

HS-026 262

ON THIS YEAR'S VACATION TRAVELS...DON'T GET RIPPED OFF ALONG THE ROAD [SHORTCHANGING AT SERVICE STATIONS]

According to the American Petroleum Inst., shortchanging people at the gas pump and maliciously damaging car parts amount to \$100 million a year racket by service stations; the National Hwy. Traffic Safety Administration says that American car owners are sold, possibly with fraudulent intent, \$2 billion worth of unneeded repairs annually. According to Shell Oil Co., oil companies often ask the assistance of police to investigate dealers accused by customers of racketeering. Exxon states that it will not hesitate to end a franchise agreement should fraudulent retail practices or serious customer complaints warrant such action; the company suggests that drivers who have repairs made at a strange service station get itemized bills and retain old parts (for "evidence"). Several other common-sense precautions to protect against disreputable gas stations include putting car in top shape before going on a trip and inspecting items that gas stations sell; getting out of the car to observe fueling; patronizing self-service stations, if possible; taking along spares for easy-to-install items (e.g. drive belt, windshield wiper); and calling the Better Business Bureau, Chamber of Commerce, or local representative of insurance company when in need of a mechanic in a strange town. Some of the deceptive practices to be aware of include shortchanging on gas (adding previous sale on pump, running credit card through machine twice or using two tickets), shortchanging on oil (not seating dipstick, using inferior oil, adding no oil), puncturing tires, dropping antacid tablets inside battery, slitting drive belts and hoses, pouring milk in power steering pump or automatic transmission filler tube, cutting or disconnecting coil-to-distributor cable, pouring gas over a fuel pump, and bending a windshield wiper.

by Mort Schultz

Publ: Popular Mechanics v151 n6 p92-3, 132, 162 (Jun 1979) 1979; Iref

Availability: See publication

HS-026 263

HOW TO KEEP THE CONTROL IN YOUR AUTOMATIC TEMPERATURE CONTROL SYSTEM [AUTOMOBILE HEATING/AIR-CONDITIONING SYSTEMS]

The components and operation are described of an Automatic Temperature Control (ATC) system, available as an option on certain General Motors 1979 model passenger cars. The temperature-control dial of an ATC system automatically maintains temperature in the car regardless of changes in outside air temperature. With the selector dial on Auto mode, discharged air at 75 degrees and below is delivered from the air-conditioner outlets; discharged air at 90 degrees and above is delivered from the heater outlet; air between 75 degrees and 90 degrees is delivered simultaneously from heater and air-conditioner units. The Bi-Level mode provides heated air at floor level and cool air at upper-body level as well as defogging of side windows and windshield by adjusting the direction of the system's outlets. The automatic blower can be overridden by switching to a Lo or Hi position. The Economy mode provides outside air ventilation when desired. In Def mode, the system delivers a large volume of defrost air from the heater outlet to windshield, as well as to car interior. The ATC is a basic air-conditioning and heating system with a programmer, control head, and two temperature sensors. The programmer, mounted in the passen-

ger compartment on the heater case, contains an amplifier transducer, feedback potentiometer, blower circuit board, and a vacuum system. The control head, behind the control panel, contains a temperature-control dial, potentiometer, blower circuit-board electric switch, in-car turn-on switch, and vacuum valve. The programmer and control-head parts are connected by electric wires and vacuum hoses. The in-car sensor is located under a grille in the instrument panel; the outside sensor is usually mounted on the evaporator inlet case.

by Mort Schultz

Publ: Popular Mechanics v151 n6 p108-10, 138 (Jun 1979) 1979

At head of title: Saturday Mechanic.

Availability: See publication

HS-026 264

CAR COMPUTERS; NEW ELECTRONIC KNOW-IT-ALLS

The new generation of car computers provides instant digital readouts on engine performance, gas consumption, and distance/rate/time problems, at the push of a button. Microprocessors (tiny computers on a single integrated circuit chip) are programmed to step through any sequence of commands; transducers (sensors) placed under the hood are used to convert mechanical motion into a usable electrical signal to the computer. These electronic systems, which can be installed by the car owner, vary in price from \$160 to \$350. Installation is not difficult and can be done in an afternoon. Plug-in cables run from the dash, through the fire wall, to sensors throughout the engine block. The systems are virtually maintenance-free; a bulb used to backlight the keyboard panel may possibly need changing. One system, the Compucruise (Zemco Inc., Walnut Creek, Calif.), automatically brings the car up to the right legal speed to arrive at a destination on time. Another, the Prince (OBC Products Div., Holland, Mich.), a citizens band monitor, alerts the driver to an accident, detour, or police, a mile in advance. A third unit, Avatar (Grass Valley Instruments, Grass Valley, Calif.), does not contain a microprocessor, but supplies precise engine and time information (e.g. surface and fluid temperature, elapsed time, battery voltage, rpm).

by Bill Hawkins

Publ: Popular Science v214 n6 p98-100 (Jun 1979) 1979

Availability: See publication

HS-026 265

NEW SHOCK ABSORBERS - SMALLER, LIGHTER, EVEN SELF-LEVELING AND TUNED TO RADIAL TIRES

Following a brief comparison of the two common systems of shock absorbers (twin-tube and monotube), some new developments in shock absorbers (damper systems) are described and some tips provided on spotting shock trouble and on buying new shocks. New developments include metering-pin damping control (J. C. Penney, Maremont); electronic height control (Monroe); self-contained, independent hydraulic leveling (Sears/Gabriel); off-road racing shocks suitable for everyday driving (Gabriel); radial tuning of shocks (K-mart); and adjustable gas-pressure shocks (Koni). With the trend to smaller cars, new products must be proportionately lighter, with no loss of strength, while performing better and more efficiently. These new requirements have seen increased materials research, computer-controlled testing and analysis, and other activities that

were low priority just several years ago. Some clues to bad shocks include large body lean on curves, wheels bouncing a great deal, high sensitivity to crosswinds, bottoming on bumps and dips, nose dive on routine braking, uneven tirewear, fluid leakage from shock absorber, rusted or broken shock parts, and worn or missing shock bushings. One of the best ways to check shocks is the bumper test (cycling the bumper up and down, releasing it, and counting oscillations before it stops). American manufacturers give original-equipment shock lifetime estimates upwards of 40,000 mi. Some buying tips include the following: first consider advantages of each damper type, and vehicle use (specialized shocks not usually required for normal driving), go mainly by manufacturer's reputation, do not buy cheapest line (false economy), invest in high-quality shocks if possible (except for an older car), and for a new car, select the heavy-duty damper option.

by Ed Jacobs
 Publ: Popular Science v214 n6 p101-3, 146-7 (Jun 1979)
 1979
 Availability: See publication

HS-026 266

CHOOSING AND USING JACKS, JACKSTANDS, RAMPS

Information is presented for the backyard mechanic to aid in selecting and purchasing the items best matched to his lifting needs (e.g. tire change, oil change, brake job). The construction, price, weight rating, and safe use are generally outlined for ramps (pyramid-shaped, with detachable inclines, or with cupped depressions), jack stands (wide or narrow triangular base or rectangular base), and jacks (floor axle scissors and bumper types). Typical examples of the many available brands and load capacities of lifting devices are pictured. A buyer's guide to jacks, jack stands, and ramps tabulates information (weight rating, price, lifting range) on samples of items from some of the leading makers and sellers. It is stated that professional-level equipment can be purchased from an equipment jobber; for less-expensive equipment, it is advised to shop around before buying. Safety suggestions are made for use of each type of lifting equipment.

by Ray Hill
 Publ: Popular Science v214 n6 p104-7 (Jun 1979)
 1979
 Availability: See publication

HS-026 267

MICHIGAN DRIVER STATISTICS

A statistical profile is provided of Michigan's 1978 populations of vehicles and drivers of record and of the 1977 records of all drivers of record on crashes, violations convictions, and various departmental driver improvement actions. Contents include overall Michigan driver, driver population and "driver of record" data, and alcohol incidents of driver records. Data on annual trends in studied drivers, driver records, and vehicle statistics provide a clearer picture of current trends and should be of increasing value each year as indicators. Also presented are the distribution of Michigan drivers by year of birth, age, sex, and percents of all drivers; by age and sex in percents by groups; and age trends of drivers by age groups from 1958-74, as well as a list of state driver statistical studies. Researchers seeking total information on accidents and people involved are advised to refer to "Michigan Traffic Accident Facts", published annually by the Dept. of State Police.

by Joseph A. Hayes
 Michigan Dept. of State, Secondary Complex, Lansing, Mich.
 48913
 Rept. No. R11; 1978; 31p
 Availability: Corporate author

HS-026 268

AN ALGORITHM FOR REAL-TIME CONTROL OF CRITICAL INTERSECTIONS

An on-line traffic signal control policy for critical intersections is developed which has the advantage of combining the major control objectives (i.e. minimize total intersection delay during the entire control period, and maintain the queue lengths at reasonable levels so that upstream intersections are not blocked). The qualitative results obtained clarify some ambiguities and resolve uncertainties related to optimal control of critical intersections. Most importantly, the resulting control policy has the potential of field implementation, since it requires minimum on-line information and conventional traffic data. The proposed control policy assumes that the traffic demands are not known a priori for the entire control period, but, at best, only one cycle ahead of time. Thus, since the advantage of long-term demand prediction is lost, the resulting policy is in some cases suboptimal.

by Panos G. Michalopoulos; George Stephanopoulos
 Publ: Traffic Engineering and Control v20 n1 p9-15 (Jan 1979)
 1979; 9refs
 Sponsored by National Science Foundation, and Dept. of Transportation.
 Availability: See publication

HS-026 269

THE EFFECTS OF GAP ACCEPTANCE CRITERIA ON MERGING DELAY AND CAPACITY AT AN UNCONTROLLED JUNCTION

Since the idealized assumption of a fixed critical gap per drive greatly simplifies analyses of gap acceptance data and calculations of delay statistics, it is useful to compare the practical implications of this assumption with those of a more realistic formulation of driver gap-acceptance behavior, in order to see how quantities of engineering interest may differ under the two criteria. The following four quantities are analyzed for comparison, for the case of the minor-road driver wishing to merge with or cross a single traffic stream which has exclusive priority: the probability of no delay, the average delay, the variance of delay, and the capacity of the minor road at the junction. The situation considered is one in which the only information available is the distribution of gaps in the main traffic stream and the distribution of those that are accepted; attention is restricted to the case of random traffic, i.e. of gaps having negative exponential distribution. The analyses show that if the idealized assumption is made and an estimate is made of the distribution of the drivers' critical gaps over the population, then for the cases considered the average delay derived from this distribution will be an accurate estimate of the true average delay. The probability of no delay and the capacity of the minor road will be slightly overestimated, and the variance of delay will be seriously overestimated. It is suggested that if a simplification in gap acceptance representation is needed, it is more accurate to assume that drivers are inconsistent but identical in their behavior, than that drivers are consistent but different in their behavior.

by Dennis E. Blumenfeld; George H. Weiss
Publ: Traffic Engineering and Control v20 n1 p16-20 (Jan 1979)
1979; 14refs
Availability: See publication

HS-026 270

SIMULATION OF JACKKNIFE CONTROL DEVICES

An existing computer-based model of tractor-semitrailer response to braking and steering (provided by University of Michigan Hwy. Safety Res. Inst.) has been modified to incorporate five antijackknife devices. Of these, four are manufactured by Safe-T-King in Canada, Hope in UK, and Breeze, and Mather in the US; the fifth is generically known as an antilock braking system. The devices are described and their operational characteristics formulated mathematically. The insertion of these models into the program is described and the program listing is included. Changes in program input and user's manual are detailed and illustrated by some examples. The program has been verified and appears to operate correctly. Instructions and examples are included to enable users to run the program.

by A. M. Billing
Ministry of Transportation and Communications, Commercial Vehicles Operations and Safety, 1201 Wilson Ave., Downsview, Ont., M3M 1J8 Canada
Rept. No. CVOS-TR-78-04; 1978; 101p 8refs
Sponsored in part by Transport Canada, Res. and Devel. Center. See also HS-026 271.
Availability: Corporate author

HS-026 271

VALIDATION OF A COMPUTER MODEL OF TRACTOR-SEMITRAILER HANDLING THAT INCLUDES FIVE JACKKNIFE CONTROL DEVICES

A computer program was developed simulating the response of a tractor-semitrailer to braking and steering when any one of five jackknife control devices is active: Safe-T-King from Canada; Breeze, Kelsey-Hayes (anti-lock), and Mather from the U.S.; and Hope from the U.K. Validation of the program, both with and without active jackknife control devices was undertaken using full scale tests of an instrumented vehicle. Test results and simulation output were compared for eight response variables from nineteen maneuvers; each variable was first qualitatively compared by plotting. Quantitative comparison determined range, mean, maximum and minimum errors. The cross correlation function between test and simulation time traces was also calculated and used to compare the overall shapes of the time histories. The program was in all cases able to predict the main features of the test vehicle response, often with surprising accuracy. All jackknife control device models performed satisfactorily except for some limitations inherent to the antilock model. Errors were shown to average about 7% of variable range, with a standard deviation of 19%. Accuracy could be significantly improved by use of more reliable tire data. Test data are appended.

by A. M. Billing; A. Visentin
Ministry of Transportation and Communications, Commercial Vehicles Operations and Safety, 1201 Wilson Ave., Downsview, Ont., M3M 1J8 Canada
Rept. No. CVOS-TR-78-07; 1978; 86p 8refs
Sponsored in part by Transport Canada Res. and Devel. Center. See also HS-026 270.
Availability: Corporate author

HS-026 272

AN INVESTIGATION OF THE POTENTIAL HUMAN AND ENVIRONMENTAL IMPACTS ASSOCIATED WITH MOTOR VEHICLE AIR BAG RESTRAINT SYSTEMS

A steady-state analysis was undertaken to evaluate, for the 1982-2001 time period, the potential impact or risks to people, property, and the environment associated with the normal use (consumer phase) and disposal of air bag restraint systems (ABRS). Risk analysis techniques, including failure mode and effect analysis and fault tree analysis, were applied to risk identification and assessment. A series of technical evaluations related to the quantification of the vehicle life-cycle population, identification and assessments of environmental impacts, and evaluation of the toxicological and explosive hazards of generant (i.e. propellant) chemicals were incorporated as input to the overall evaluation. It is concluded that there are no identifiable events in the ABRS life cycle which could be classified as imminently dangerous to either humans or environmental species. Certain low-probability events require further analysis to ensure that any potential impacts are both minimal and within acceptable limits for the situations. Extreme precautions must be taken to ensure that generant chemicals consistently produce high-quality effluent gases which are nontoxic to humans under anticipated-use conditions. Air bags within vehicles being scrapped must be deactivated early in the salvage cycle to protect scrapyard workers from acute injury during attempts to remove or deploy the ABRS or from chronic exposure to either the gases released during deployment or chemicals contained in the inflator. There do not appear to be significant environmental impacts associated with normal deployment of ABRS or the abandonment of vehicles with nondeployed inflators. The scrap processing of ABRS-equipped vehicles through shredders or related equipment can cause both process water and byproduct residues to become contaminated with chemicals. Contaminated materials must be handled and disposed of properly. Precautions must be taken to prevent the formation of potentially explosive substances. Live inflators that retain integrity through the scrap cycle and become part of the scrap-metal charge for manually-charged steel-manufacturing furnaces pose a work hazard. Critical comments by the MVMA Gas Generants Ad Hoc Com. supplement the report.

Arthur D. Little, Inc., Cambridge, Mass. 02140
1978; 260p refs
Sponsored by Motor Vehicle Manufacturers Assoc. of the United States, Inc. See also HS-026 274.
Availability: Motor Vehicle Manufacturers Assoc. of the United States, Inc., 300 New Center Bldg., Detroit, Mich. 48202

HS-026 273

GAS GENERANTS RESEARCH. VOL. 1. EXECUTIVE SUMMARY. FINAL REPORT

Battelle Columbus Labs., 505 King Ave., Columbus, Ohio 43201
1978; 44p 5refs
Sponsored by Motor Vehicle Manufacturers Assoc. of the United States, Inc. For abstract, see HS-026 274.
Availability: Motor Vehicle Manufacturers Assoc. of the United States, Inc., 300 New Center Bldg., Detroit, Mich. 48202

HS-026 274

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GAS GENERANTS RESEARCH. VOL. 2. TECHNICAL DISCUSSION. FINAL REPORT

A project was undertaken to consolidate, verify, and expand the current knowledge base regarding gas generants (i.e. propellants) for air bag restraint systems in order to identify any potential risks in their manufacture, use, and disposal. An analysis was first made of data on the toxicological, ecological, and environmental effects of gas generants, followed by a systematic identification and assessment of the various potential hazards/risks associated with large-scale use of various gas generant systems (sodium azide, potassium perchlorate hybrid) in automobile restraint systems. Exploratory or verification experiments were conducted to provide additional information on key issues for which available data were found to be insufficient. Shredding, impact, actuation, bonfire, laboratory-scale melting, baling, and residue mutagenicity and toxicity experiments were conducted. In general, a great deal is known about the health and ecological effects of the individual compounds which go into the gas generant systems and the individual constituents in their effluents, but relatively little is known about the possible combined effects of the generant formulations and collections of effluents. Briefly stated, the primary hazards/risks for the manufacturing phase are those that normally exist with the manufacture of pyrotechnic devices, toxic chemicals, and/or high-pressure gas cylinders. In the consumer phase, the hazard areas appearing to most warrant further attention are those concerned with inadvertent deployment and maldeployment resulting from consumer or service personnel "errors". Successful treatment of associated potential consumer-phase hazards should minimize similar hazards during the dismantling period. Some significant potential hazards associated with baling, shredding, etc., present a more controllable situation than those involving the motorist. There are a significant number of potential hazards associated with tampering, vandalism, and bounties. It is concluded that of all the potential concerns few represent any real risks. Open issues are identified, and specific recommendations for further study proposed. Critical comments by the MVMA Gas Generants Ad Hoc Com. supplement the report.

Battelle Columbus Labs., 505 King Ave., Columbus, Ohio 43201
1978; 296p refs

Sponsored by Motor Vehicle Manufacturers Assoc. of the United States, Inc. For summary report, see HS-026 273. See also HS-026 272.

Availability: Motor Vehicle Manufacturers Assoc. of the United States, Inc., 300 New Center Bldg., Detroit, Mich. 48202

HS-026 275

FROM HYDROLASTIC TO HYDRAGAS SUSPENSION

The development of the fluid-interconnected Hydrolastic and Hydragas suspension systems for passenger cars is reviewed, followed by a description and explanation of their principles. Comparisons are made of ride performance between these systems and the conventional suspension by both road measurements and mathematical modeling. Comparisons of cost and weight for various installations are shown. The concept of hydraulic interconnection to reduce pitch frequency, with the fluid hermetically contained, is stated in Alex Moulton's patent (first application in London in 1954). The concept has been developed in five phases spanning more than two decades, starting with the founding of Moulton Developments Ltd. The essential feature of the suspension system is that the weight of the car is carried by a water-based fluid under a pressure of 250 lbf/sq in for Hydrolastic and up to 400 lbf/sq in for Hydragas, which is

hermetically contained within the units. No pumps or glands are required. These units are hydraulically interconnected between the front and rear on each side of the car by means of pipes in order to reduce pitch stiffness. Interconnection also provides an inherent means of balancing the load taken by the four wheels. The Hydrolastic unit, which has now been superseded by Hydragas, had a bonded rubber "bung", which acted as the bounce spring; in Hydragas, this springing is done by encapsulating nitrogen. In the Hydrolastic, the interconnection is above and in series with the bounce damper valves; in Hydragas, the interconnection is "under port" and in parallel with the bounce dampers. The Hydragas system imparts a big car ride to smaller vehicles, while offering minimum life-cycle cost.

by A. E. Moulton; A. Best

Publ: Proceedings of the Institution of Mechanical Engineers v193 p15-37 (Mar 1979)
1979; 7refs

Prepared for presentation at Ordinary Meeting of Automobile Div., Institution of Mechanical Engineers, London, 11 Jan 1979
Availability: See publication

HS-026 276

THE TRRL [TRANSPORT AND ROAD RESEARCH LABORATORY] QUIET HEAVY VEHICLE PROJECT

A cooperative program sponsored by the Transport and Road Res. Lab., TRRL (England), and initiated in 1971 resulted in heavy, diesel-engined tractors having considerably lower external and internal noise levels than heavy commercial trucks in current operation. Other organizations involved were Foden Ltd., Rolls-Royce Motors Ltd., Leyland Vehicles, the Motor Industry Res. Assoc., the Inst. of Sound and Vibration Res. (ISVR) of Southampton Univ., and the National Engineering Lab. (NEL). The work was directed at reducing the levels of noise from the engine, exhaust and cooling systems, tire-road surface interaction, and the transmission of noise into the cab. The TRRL Quiet Heavy Vehicle Proj. was successful in producing two research vehicles emitting external noise levels 10 dBA less than the original vehicles and having greatly reduced internal noise levels. The Foden/Rolls-Royce tractor has been developed to demonstration form by Fodens. This fully engineered, practical vehicle includes a version of the ISVR research engine designed and built to produce engineering standards by Rolls-Royce, a production version of the mufflers, and the new cooling system based on the NEL mixed-flow fan. In this form, the vehicle has met the project target of 80 dBA for external noise and at 72 dBA has exceeded the target for internal cab noise. The costs of production and operation are still being evaluated.

by J. W. Tyler

Publ: Proceedings of the Institution of Mechanical Engineers v193 p137-47 (Mar 1979)
1979; 7refs

Prepared for presentation at Ordinary Meeting of Automobile Div., Institution of Mechanical Engineers, Warrington, England, 15 Feb 1979.

Availability: See publication

HS-026 277

GASOHOL: PROBLEMS AND POSSIBILITIES

Tests involving ten vehicles each driven about 1900 mi on a blend of 90% unleaded gasoline and 10% ethanol revealed both advantages and disadvantages in the use of gasohol. All cars ran well when the engines were warmed up but some were reported sluggish at low speeds, were hesitant on acceleration when the

engines were cold, and had a tendency to stall due to three-phase separation (alcohol dissolved in water). The use of gasohol showed little effect on tailpipe emissions. There was an overall fuel economy loss of over .8 mpg (from 12.3 to 11.5) when cars were switched from unleaded gasoline to gasohol, but the engines were not adjusted for gasohol use and 190-proof ethanol (vs. a better-burning 200-proof alcohol) was utilized. Total gasoline consumption was improved; mpg dropped by 6.5%, but the addition of 10% alcohol as a gasoline extender produced a net savings of 3.5% in gasoline, since gasohol cost 11 cents less than the gasoline used in the test. It is noted that special permission was obtained for the test from the California Air Resources Board, since it is presently illegal in California to modify a car's engine so that it will run on gasohol.

Publ: Motorland v100 n3 p46 (May-Jun 1979)

1979

Availability: See publication

HS-026 278

PROTECTING YOUR HEAD WITH SNELL '75. A GUIDE TO HELMET STANDARDS AND A LIST OF THE BEST HELMETS

The excellence of the Snell Memorial Foundation standard for motorcycle helmets is stated, and helmets passing this standard are described. The Snell standard, periodically revised to meet improvements in technology, requires that a helmet not transmit an impact force of more than 200 g's for more than two msec, and that it protect the brain from direct impacts of about 18 mph. The standard is pass/fail, and all helmets built to conform to it have a red Snell 1975 (most recent) sticker, complete with serial number, inside the helmet. Lab testing for the Snell standard measures a helmet's impact absorption, chin-strap retention, and resistance to shell penetration. Any given sample of a helmet model (sample helmets bought by Snell representatives from retail stores at random) must be able to pass the tests after being soaked in water, frozen, or baked in an oven for 24 hr. Only helmets made of fiberglass-and-resin shell (or, in the case of certain Shoei and Arai models, of a combination of fiberglass with aramid or carbon fiber for equal strength and less weight) have passed Snell 1975 at this time. Thirty-two helmet models passing the standard are pictured and described in terms of open vs. full face type, construction, size range, price, and color.

by John Ulrich

Publ: Cycle World v18 n5 p156-7, 160, 162-4, 168, 209-11 (May 1979)

1979

Availability: See publication

HS-026 279

THE NUMBERS GAME [MOTORCYCLE ACCIDENT STATISTICS]

Some results have been drawn from a comprehensive study by the Univ. of Southern California, under the sponsorship of the National Hwy. Traffic Safety Administration, of nearly 900 motorcycle accidents in the Los Angeles area. It was found that 30% of collisions involved the front of the motorcycle, 36% the left side, 31% the right, and only 3% the rear. The most prevalent accident involved a car making a left-hand turn in front of an oncoming motorcyclist (45%). Other vehicles violating the motorcyclist's right of way were implicated in 51% of the accidents; 41% of the accidents were attributed to rider error; only 3% involved mechanical problems. Although exposure figures are not yet available to make comparisons with

motorcyclists not involved in accidents, the study revealed that nearly half of the motorcycles involved in multivehicle accidents were rated difficult to see. Of the accident-involved cyclists, 60% were unhelmeted and accounted for 67% of the total injuries and 81% of the head and neck injuries. Other findings indicate that improper evasive action was taken by 65% of cyclists; 12% of cyclists had been drinking prior to accident (53% of fatalities had alcohol in blood); females accounted for 3.8% of accident sample; 1/3 of accidents involved motorcycles with engines of at least 750 cc (1/2 of fatal accidents involved 750 cc or larger bikes); 55% of motorcyclist had required license (12% had no license); overall riding experience averaged three years (over half of cyclists with less than six months experience); 8% of riders had some formal rider training; helmets caused only four minor injuries; and 2.2% of helmeted riders were fatally injured (vs. 3.5% of nonhelmeted riders).

Publ: Cycle World v18 n3 p31-2 (May 1979)

1979

At head of title: Cycle World Roundup.

Availability: See publication

HS-026 280

DESIGN ADVANCES IN GLASS CORD REINFORCED RADIAL TIRES

Fiberglass, trademarked "Fiberglas" by Owens-Corning, has been accepted by original equipment and aftermarket manufacturers as a tire belt material (45 million glass radials currently in service, 24 million in service over two years). For the future, radial carcass development work (indoor wheel tests, road tests for durability and wear, road abuse tests, field service tests, aesthetic evaluations, tire physical tests) by tire manufacturers as well as efforts by the Owens-Corning Technical Center should result in commercial production of radial tires with fiberglass carcasses. The inherent advantages of fiberglass as a tire-reinforcement material are high strength, excellent adhesion, near perfect elasticity, modulus compatibility between carcass and belt, manufacturing efficiency of the monoplex construction, creel calendaring capabilities which should improve reinforcement uniformity, and insensitivity of physical properties to high temperature. Lower denier cords allow for additional rubber reductions, further reducing the hysteretic loss which contributes to rolling resistance. Weight reductions recently achieved, utilizing both the standard 1/0 product at 28 ends per inch and experimental 1/0 at 20 ends per inch, have reduced the carcass weight by 50% to 65% compared with earlier (1973) concepts. Fiberglass is less energy-dependent than other tire-reinforcing materials and is expected to remain the most cost-effective tire reinforcement. Now in the testing stage, a BR78x13 all-glass radial tire (carcass and belts) has given excellent performance.

by J. A. Gooch

Publ: Elastomerics v111 n5 p29-32 (May 1979)

1979

Based on a paper "Evolving Design Concepts for Fiberglass Radial Tires," presented to Akron Rubber Group, 26 Jan 1979.

Availability: See publication

HS-026 281

CHRYSLER'S NEW FRONT WHEEL DRIVE AUTOMATIC TRANSMISSION

The design and development are described of a new three-speed automatic transmission, produced by the Chrysler Corp. for its front wheel drive vehicles. Designed around the TorqueFlite concept, it includes a one-piece aluminum die cast case; "Simp-

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son" planetary gear train; a "Folded" design incorporating a transfer shaft parallel to the transmission and two helical gear sets which together yield the overall top gear ratios; gear type oil pump; one-sided governor; and room temperature vulcanizing (R.T.V.) silicone sealer sealed transmission case covers. Photographs of components and a hydraulic control schematic are included.

by Dugald Cameron; Alfred P. Blomquist
Chrysler Corp.
Rept. No. SAE-790018; 1979; 12p
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979
Availability: SAE

HS-026 282

THE APPLICATION OF ANTIOXIDANT ANALYSIS TO TRANSMISSION FLUID TESTING

The determination of the total antioxidant capacity of new and used automatic transmission fluids can yield information useful in the study of fluid stability, severity of service, and correlation between bench tests and service. The technique is particularly useful in the characterization of the earlier stages of fluid oxidation where parameters such as T.A.N., pentane insolubles and viscosity yield little information. Three fluids from a fleet test manifested different antioxidant decay profiles, related to their oxidation stability. Beaker test data at 130 degrees C under air gave antioxidant decay curves similar to vehicle data, which could be superimposed by assuming that one beaker test hour was equivalent to 400 vehicle km. This shift factor gave a reasonable correlation for pentane insoluble formation between vehicle and beaker test data for fluid A; insufficient mileage has been accumulated to date on the more stable fluids B and C to establish such a correlation. Indications are that some test conditions can reproduce these decay curves and thus simulate the primary oxidation processes occurring in the transmission in this fleet. The technique employed in measuring total antioxidant capacity, or $n(AH)$, is summarized in the appendix. This capacity is defined as the molar concentration of peroxy radicals required to consume the antioxidants present in a sample.

by P. A. Willermet; L. R. Mahoney; S. K. Kandah; A. W. Sever
Ford Motor Co., Dearborn, Mich.
Rept. No. SAE-790016; 1979; 8p 11refs
Technical Paper Series. Presented at Congress and Exposition, Detroit 26 Feb-2 Mar 1979
Availability: SAE

HS-026 283

AUTOMATIC TRANSMISSION FLUID OXIDATION. A COMPARISON OF SHORT TERM WITH LONG TERM TESTING

The extent of automatic transmission fluid oxidation is compared for short term bench transmission tests with long term vehicle tests, using long term taxicab data from four fleet tests. The technique of Blotter Spot Analysis (BSA) used in the comparison is described. Three automatic transmission fluids (ATF) containing two different additive systems were used. Test tube oxidate tests, bench transmission tests, and field tests in vehicles are discussed; photographs and tables are presented. It is concluded that the extent of oxidation was less in the long term taxicab tests than in the short term bench transmission tests; the two ATF additive systems demonstrated adequate resistance to oxidation in taxicab tests; BSA provides useful information on

HSL sb

ATF performance in glassware, bench transmission, and vehicle field tests, and is useful for comparing the severity of various kinds of ATF tests involving oxidation, and for interpreting ATF performance in a vehicle field test involving several vehicles; BSA can help decide when an ATF should be changed after severe service.

by Edward J. Friihauf
Lubrizol Corp.
Rept. No. SAE-790017; 1979; 24p 6refs
Technical Paper Series. Presented at Congress and Exposition, Detroit 26 Feb-2 Mar 1979
Availability: SAE

HS-026 284

FUEL ECONOMY OF ALTERNATIVE AUTOMOTIVE ENGINES. LEARNING CURVES AND PROJECTIONS

An approach in making technological forecasts is described which is based on a study and review of learning curves. From historical data, fuel economy learning curves were constructed for alternatives such as the Diesel, gas turbine, Stirling, stratified charge, and rotary engines. Assuming that evolutionary development will take place, projections of these learning curves extended to the 1990 era. A baseline of approximately 35 tpm/g was found representative of 1978 automobiles; it is the product of inertia weight multiplied by the combined city/highway fuel economy. The authors project the baseline for average uniform charge, carbureted spark ignition engine to 40 ton-mpg by 1990; the value may be less if levels of control for oxides of nitrogen are set at less than one gram per mile. The investigation found that no engine is likely to exceed the fuel economy of the Diesel in the next 10-15 years, although serious questions are raised regarding the feasibility of controlling nitrogen oxides and unregulated emissions in future Diesel engines. The open chamber stratified charge engine also promises good fuel economy in time, both in reciprocating and rotary configurations. Variable displacement engines can provide economy improvement in the range of 10-20%, but the side effect of varying the piston displacement per mile of travel also be achieved with gearing. The gas turbine and external combustion Stirling and Rankine engines have a potential for low exhaust emissions, but these technologies are relatively immature compared to the internal combustion engine; the Stirling is likely to excel in fuel economy.

by Roy Renner; Harold M. Siegel
South Coast Technology, Inc., Santa Barbara, Calif.
Rept. No. SAE-790022; 1979; 16p 80refs
Technical Paper Series. Presented at Congress and Exposition, Detroit, 26 Feb-2 Mar 1979
Availability: SAE

HS-803 623

CITIZEN'S BAND RADIO HIGHWAY SAFETY EVALUATION PROJECT

A project is described which was conducted by the New York State Police, (NYSP) and its subcontractor, Advanced Technology Systems, Inc., (under sponsorship of the National Highway Traffic Safety Administration) to measure the effectiveness of citizen's band (CB) radio use by state police as a means to improve highway safety. The following parameters were measured to determine differences between use and nonuse of radios by state police in a seven-county region in north-central New York State from 3 Jan 1977 through 19 Jun 1977; response

time of emergency services to highway safety incidents; number of reports/detections of motor vehicle accidents, selected unsafe driving acts, and violations; number of reports/detections of unsafe driving conditions; number of services provided by CB radio (e.g. road directions and weather conditions); number of reports received by CB radio in conditions leading to traffic delays; number of contracts established with the motoring public through CB radio; and number of reports received by CB radio on criminal acts in progress or completed. It was concluded that CB radio, as operated under the present Federal Communications Commission regulatory structure, is a valuable assist to both the motorist or citizen seeking aid and the public safety agencies providing that aid. Some problems are solved in part, some not at all, and other new problems are introduced through the use of CB radios. Specific conclusions are provided reflective of the level of success achieved by use of CB radios in the evaluation project. Recommendations are provided which illustrate how CB radio's use can be expanded into a radio service that better meets the needs of all motorists and public service/safety organizations. (Included is a NYSP brochure for CB operators on the use of the Channel 9 emergency frequency in the seven-county project area--KNY--0911.)

National Hwy. Traffic Safety Administration, Traffic Safety Programs, Washington, D.C. 20590
1979; 68p 2refs
Availability: Corporate author

HS-803 655

PARAMETRIC ANALYSIS OF LIGHT TRUCK AND AUTOMOBILE MAINTENANCE. FINAL REPORT

Utilizing a previously developed Automotive and Light Truck Service and Repair Data Base for 212 domestic and foreign vehicles (model years 1970-1975), parametric analyses were made of the relationships between maintenance costs, scheduled and unscheduled, and vehicle parameters (body class, manufacturer, engine size, vehicle weight, model year, and facility type). Technological innovations, including radial tires, lightweight bodies, fuel injection, and catalytic converters, exhaust gas recirculation, high-energy ignition, electronic control, diesel, stratified charge, Stirling cycle, gas turbine, and transmission modifications, were analyzed for their impact on the future trends in maintenance costs. A methodology was developed for the assessment of component durability, along with a determination of the failure modes of high-volume aftermarket items as a basis for the evaluation of the impact of future technological innovations on maintenance costs. (Appended are computer-generated parametric graphs, a vehicle list, and lists of vehicle identification numbers included in each parametric analysis.)

by Donald A. Hurter; Nancy C. Gardella; Philip G. Gott
Arthur D. Little, Inc., Automotive Technology Group, Acorn Park, Cambridge, Mass. 02140
DOT-TSC-1047
Rept. No. DOT-TSC-NHTSA-79-14; 1979; 224p refs
Rept. for Jun 1976-May 1978. See also HS-803 376.
Availability: NTIS

HS-803 800

DRIVER LICENSE APPLICANT IDENTIFICATION AND LICENSING SYSTEM SECURITY. GUIDELINES FOR MOTOR VEHICLE ADMINISTRATORS

Guidelines for motor vehicle administrators are provided for the purpose of improving the validity of the driver license as an

identifying document. Since it is recognized that the identification value of a driver license, for any purpose, is no better than the documents used initially to identify the licensee, guidelines are presented for identification criteria for original, duplicate, renewal, and exchange licenses, as well as for security of the licensing system. The major portion of the text consists of the following appended material: a model plan for implementation of an identification and security system prepared by California Dept. of Motor Vehicles (DMV), a report of a pilot study of duplicate license issuance procedures by Virginia DMV, tabulated data on outstanding driver licenses in the California population, a plan developed by the MITRE Corp. (under contract to the Law Enforcement Assistance Administration--LEAA) for reducing the abuse of birth certification (attached are several proposed model acts and associated regulations which illustrate the statutory base required for adequate protection of vital records against misuse), and recommended Federal guidelines for improved driver license security developed by MITRE for LEAA. Attached is a Bureau of Engraving and Printing report providing suggested document security elements for driver licenses (prepared for the Federal Advisory Com. on False Identification).

National Hwy. Traffic Safety Administration, Washington, D.C. 20590; American Assoc. of Motor Vehicle Administrators, Standing Com. on Driver License and Control
1979; 147p 5refs

Prepared in cooperation with National Hwy. Traffic Safety Administration

Availability: GPO, stock no. 050-003-00348-4

HS-803 959

IMPACT OF THE REPEAL OF THE KANSAS MANDATORY MOTORCYCLE HELMET LAW. AN EXECUTIVE SUMMARY. FINAL REPORT

The effect of the repeal of the Kansas mandatory motorcycle helmet use law (effective 1 Jul 1976) was evaluated through a retrospective analysis of injury incidence and severity in motorcycle accidents before and since repeal. Within the boundaries of a representative study area, data concerning accidents and injuries were gathered for a study period of stable motorcycle usage during both 1975 and 1976. In addition, an observational survey was completed during 1977 to determine current usage of motorcycle helmets and/or eye protection. The data indicate that statistically significant increases in the incidence and severity of injuries to the head and to the general body occurred between the pre- and post-repeal periods. Extremely significant increases in the incidence/severity of head/general body injuries were found for nonhelmeted vs. helmeted motorcyclists. The data also indicate that the crude death rate for nonhelmeted motorcyclists was significantly higher than that for motorcyclists wearing helmets. Of those observed, 47.1% wore motorcycle helmets, 70.2% of these having some form of eye protection.

by Michael L. Lummis; Glenn J. Tucker
University of Kansas Coll. of Health Sciences, Emergency Medical Training Prog., 39th at Rainbow Blvd., Kansas City, Kans. 66103

DOT-HS-7-01563

1979; 21p

Rept. for Jul 1975-Sep 1976.

Availability: NTIS; corporate author

HS-803 965

HSL sb-39

HS-803 965

HEAVY DUTY VEHICLES

This bibliography represents literature acquired since the establishment of the National Hwy. Traffic Safety Administration (NHTSA) on the subject of heavy-duty vehicles and equipment. The cited documents comprise NHTSA contract reports, reports of other organizations concerned with highway safety, and articles from periodicals in related fields. Citations follow the format used in the monthly abstract journal "Highway Safety Literature" (the cited documents included in Jan 1967-May 1978 issues), and are indexed by a keyword-out-of-context (KWOC) listing, author, corporate author, contract number, and report number. Documents may be examined at NHTSA's Technical Reference Branch; availability is given in the individual citations.

by Lois Flynn, comp.

National Hwy. Traffic Safety Administration, Technical Reference Div., Washington, D.C. 20590
Rept. No. NHTSA-SB-31; 1979; 78p refs
Rept. for Jan 1967-May 1978.
Availability: NTIS

HS-803 993

NASS [NATIONAL ACCIDENT SAMPLING SYSTEM] INVESTIGATOR TRAINING. EVALUATION OF THE FIRST TRAINING CYCLE. FINAL REPORT

The effectiveness of an introductory training course for investigators in the National Accident Sampling System (NASS) and related segments of the overall training cycle are evaluated. The course was administered to 40 NASS trainees, representing ten accident investigation teams (primary sampling units) and two Zone Centers; the trainees completed the 12-week training program on 3 Feb 1978. The course objectives were to teach the trainee the concepts and procedures of vehicle inspection, site inspection, interviewing, injury coding, basic measurement and physics, the Calspan Reconstruction of Accident Speeds on the Highway program, and the elements of a complete NASS case study. For each phase of the initial training cycle (introduction to field techniques, on-the-job training, advanced field techniques), the following aspects are examined: major instructional objectives; philosophy of instructional design; structures, schedule, and implementation of the course; evaluation plan and results; stronger areas of the course; areas in need of improvement; and recommended changes for future training. Overall, the training program for the initial cycle is viewed as successful. The NASS program is still under development, and much of what will be done in future training cycles will be influenced by the outcome of a pilot study now being conducted.

by Raymond E. Reilly; Robert A. Evans

Allen Corp. of America, 517 S. Washington St., Alexandria, Va. 22314

DOT-HS-7-01577

1978; 144p refs

Availability: NTIS

HS-804 016

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES. THIRD SERIES, REPORT NO. 11; 1978 OLDSMOBILE DIESEL, 350 CID (5.7 LITERS), F.I. INTERIM REPORT, JANUARY 1979

For the 11th in a series of 15 engines to be tested to obtain performance data for estimating fuel economy and emissions for varied engine service and duty, experimental data were obtained in dynamometer tests for a 1978 Oldsmobile 350 cu-in-displacement (CID) diesel engine. Fuel consumption and emissions (hydrocarbon, carbon monoxide, nitrogen oxides) were monitored at steady-state engine operating modes. Oldsmobile uses the 350 CID diesel engine in the Delta 88 and in the Custom Cruiser wagon with inertia weights of 4500 lb and 5000 lb, respectively. The engine as equipped is intended for use in a 49-state vehicle with automatic transmission. The intent of the work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.

by D. E. Koehler; W. F. Marshall

Department of Energy, Bartlesville Energy Technology Center, P.O. Box 1398, Bartlesville, Okla. 74003

DOT-HS-RA-77-07

Rept. No. BETC/OP-78/56; DOT-TSC-NHTSA-79-22; 1979; 38p

Availability: NTIS

HS-804 027

THE NATIONAL ACCIDENT SAMPLING SYSTEM. A STATUS REPORT. VOL. 1: OBJECTIVES OF THE NATIONAL ACCIDENT SAMPLING SYSTEM

The National Accident Sampling System (NASS) is an important National Hwy. Traffic Safety Administration project to improve the accident data base for the highway safety community. NASS is to be primarily a statistical system whose collected data is to be accurate, objective, and consistently reported among the accident investigation teams. Emphasis by NASS staff is to be on communication with users of data collected. NASS field teams are to be a resource and an integral part of their community. NASS primary objectives are as follows: to estimate and disseminate annual national totals and rates of accidents, accident causes, and consequences, at a level of detail not currently available; and to evaluate existing countermeasures, Motor Vehicle Safety Standards and Highway Safety Program Standards; to provide data during the field test or demonstration phase of proposed standards and countermeasures to assist in the evaluation of likely accident- and injury-reducing benefits; to provide a current and detailed accident and injury causation data base suitable for establishing priorities for, and assisting in the design of, future countermeasures; and to monitor changes and trends in the highway safety environment. Implementation of NASS has begun, including the establishment of the first ten randomly-selected accident data collection sites; the complete system will not be operational before 1982.

National Hwy. Traffic Safety Administration, National Center for Statistics and Analysis, Washington, D.C. 20590

1979; 35p 9refs

Vol. 2, Plan for a Pilot Study, is HS-804 028; Vol. 3, Implementation, is HS-804 029.

Availability: Corporate author

HS-804 028

**THE NATIONAL ACCIDENT SAMPLING SYSTEM.
A STATUS REPORT. VOL. 2: PLAN FOR A PILOT
STUDY**

The National Accident Sampling System (NASS), NHTSA's (National Hwy. Traffic Safety Administration's) motor vehicle accident data system, has been designed and is being partially implemented in a pilot study. The objectives of NASS are to produce accurate national estimates of the accident experience, and to provide a data base for devising and evaluating safety standards and accident countermeasures. To achieve these goals, the system is designed to operate in the following two modes: continuous sampling of highway accidents at fixed sites (primary sampling units) to obtain information on a permanent set of data elements, the Continuous Sampling System (CSS), and performance of special studies to resolve specific safety problems or support special analyses of the CSS data bank. The plan for the pilot study, whose purpose is to assess the functioning of the CSS and provide data for optimizing sample size and cost effectiveness, is described. Performance and effectiveness measures, and the rationale for their selection, are discussed. Details of study data acquisition are given in conjunction with a description of NASS structure. The pilot study period is from 3 Apr through 31 Oct 1978.

by Ernst Meyer

National Hwy. Traffic Safety Administration, National Center
for Statistics and Analysis, Washington, D.C. 20590
1979; 60p 3refs

Vol. 1, Objectives, is HS-804 027; Vol. 3, Implementation, is
HS-804 029.

Availability: Corporate author

HS-804 029

**THE NATIONAL ACCIDENT SAMPLING SYSTEM.
A STATUS REPORT. VOL. 3: IMPLEMENTATION
OF NASS SUBSYSTEMS**

After some background on the development of the National Hwy. Traffic Safety Administration's National Accident Sampling System (NASS), the current status of major NASS components are described in detail. The fundamental design objective of NASS is to provide detailed, nationally-valid statistics on highway traffic accidents. The major components of NASS function in support of the Continuous Sampling System (CSS) and the Special Studies (SS), the two basic NASS systems. The CSS, the heart of NASS, is designed to produce unbiased estimates of key national statistics and to measure the possible errors present in these estimates due to sampling. There are two categories of Special Studies, the first falling within the CSS sampling frame of police-reported accidents for which the CSS data alone are insufficient, the second requiring data outside the sampling frame. Sample design, field management, training, data processing, methodology development, exposure data collection, and periodic reporting are discussed separately.

by Eugene Lunn; Mike Brick; Ernst Meyer; Vern Roberts; Jim Hedlund; Jim Fell; Glenn Parsons; Russell Smith

National Hwy. Traffic Safety Administration, National Center
for Statistics and Analysis, Washington, D.C. 20590
1979; 127p 11refs

Vol. 1, Objectives, is HS-804 027; Vol. 2, Plan for a Pilot Study,
is HS-804 028.

Availability: Corporate author

HS-804 096

**MOTORCYCLE ACCIDENT CAUSE FACTORS AND
IDENTIFICATION OF COUNTERMEASURES.
STATUS REPORT OF ACCIDENT INVESTIGATION
DATA. PRELIMINARY REPORT.**

Preliminary data and findings are presented from in-depth investigations of 900 motorcycle accidents and the analysis of 3600 traffic accident reports of motorcycle accidents in the Los Angeles, Calif. area. Comprehensive data were collected and synthesized for these accidents to cover all details of environmental, vehicle, and human factors. These preliminary data identify causal factors, relate the effectiveness of safety equipment and protective devices, and identify countermeasures. The failure of motorists to detect and recognize motorcycles was the predominating cause of accidents. The use of a safety helmet was the single critical factor in prevention or reduction of head injury. Vehicle failures caused less than 3% of the accidents. Only 54.5% of the accident-involved riders had a current motorcycle driver license; 92% of these riders had no formal motorcycle training. Forty-one percent of accidents were caused by motorcyclist error. Forty percent of the accident-involved riders were wearing helmets; 23% of fatally-injured riders were wearing helmets but only one died of head injuries. Intersections at which the vehicle turned left in front of the oncoming motorcycle were the most common accident situations. Significant collision avoidance problems among motorcyclists were found; fuel system leaks and spills were present in 62% of the motorcycles during the postcrash phase. Half of the injuries to the somatic regions were to the ankle-foot, lower leg, knee, and thigh-upper leg. High-visibility upper torso garments and use of headlamps during daytime appear to be effective accident countermeasures. Alcohol/drug use was present in 12% of accidents, but in 45% of fatal accidents.

by Hugh H. Hurt, Jr.

University of Southern California, Traffic Safety Center,
University Park, Los Angeles, Calif. 90007
DOT-HS-5-01160

Rept. No. USC-TSC-79-3; 1979; 186p 6refs

Rept. for Jan 1976-Dec 1978.

Availability: NTIS

HS-804 319

**RESEARCH SAFETY VEHICLE. PHASE 3. STATUS
REPORT NO. 12, 1 NOVEMBER TO 31 DECEMBER
1978**

Emphasis of Calspan Corp. and Chrysler Corp. during this reporting period was placed on further development and refinement of restraint systems and the fabrication of the Phase 4 Research Safety Vehicles. The second pedestrian buck was shipped to Germany and 12 spare hoods to Battelle for use with the first pedestrian buck. The first full car, Phase 4 Vehicle No. 3, was accepted with some open items to be completed, so that it could be taken to the Chrysler Proving Grounds in Chelsea, Mich., to initiate subjective ride and handling testing. Static crush tests of the knee blocker were used to develop a satisfactory support structure for that portion of the restraint system. Individual tests conducted on the air bag cover and the air belt indicated satisfactory performance of specific examples of components to be used in Phase 4 vehicle fabrication. Simulations run using the CVS III program supported improvement as well as the possibility of achieving satisfactory occupant protection in the 40 mph range with contemplated changes. Revisions of the structure were designed so that they might be accommodated in the final vehicles with a minimum of retrofit to the

HS-804 320

HSL sb-3

restraint systems. It is not clear whether the delivery of all vehicles will be completed by the end of Jan 1979.

Calspan Advanced Technology Center, P.O. Box 400, Buffalo, N.Y. 14225
DOT-HS-7-01551

Rept. No. ZN-6069-V-26; 1978; 45p 1ref

See also HS-804 320.

Availability: Reference copy only

HS-804 320

RESEARCH SAFETY VEHICLE, PHASE 3. STATUS REPORT NO. 13, 1 JANUARY TO 28 FEBRUARY 1979

Fabrication of the Phase 4 Research Safety Vehicle was largely completed during this reporting period. Car No. 3 was subjected to ride and handling tests at the Chrysler Proving Grounds in Chelsea, Mich. and then shipped to Phoenix where Calspan ran driveability and handling tests at the Dynamic Science test track. Sled tests were completed using the modified knee blocker support and the 55 g sled pin to simulate a 40 mph frontal crash. Both passenger and driver survival was demonstrated under conditions which, when viewed in conjunction with the CVS III simulations, implied the possibility of success in an actual barrier crash at 40 mph. Car No. 3 was crash tested (40 mph frontal barrier) at Calspan. The collapse of the basic vehicle structure occurred very nearly as desired, with good crush space utilization, minimum passenger compartment intrusion, and little or no pitch; but neither driver nor right front passenger met all Federal Motor Vehicle Safety Standard occupant injury criteria. Because of ancillary component failure, this crash is not felt to be a valid test of either of the restraint systems. The lack of retention of the thrust bearing within the steering column changed the collapse mode of the wheel so that the air bag was not provided adequate support. The passive air belt failed to inflate because of a broken wire in its gas generator ignition system. Phase 4 Vehicles Nos. 4, 5, and 7 were shipped to Europe for examination and testing. Delivery of the final four vehicles is anticipated for March.

Calspan Advanced Technology Center, P.O. Box 400, Buffalo, N.Y. 14225

DOT-HS-7-01551

Rept. No. ZN-6069-V-27; 1979; 90p 5refs

See also HS-804 319.

Availability: Reference copy only

HS-804 355

SURVEY OF AUTOMOTIVE REPAIR PRACTICES. DRAFT REPORT

Two Dept. of Transportation (DOT) consumer advisory news releases and a draft report, simultaneously issued, are presented concerning the results of a DOT-sponsored undercover survey of auto repair shops in seven cities. The study involved a team of Johnson Environmental and Energy Center researchers who traveled to the cities, acquired cars, documented their existing mechanical condition, induced preselected malfunctions (excluding brakes), presented the cars to randomly-selected shops with a request to look at the brakes and fix anything that needed fixing, and reinspected the vehicles upon return according to the UAH Auto Check, a DOT-funded automotive diagnostic demonstration project. Sixty-two auto-repair shops in Atlanta, Philadelphia, Miami, Nashville, Houston, White Plains (N.Y.), and Brooklyn were involved, and 120 repair actions representing \$3163.32 were analyzed. It was determined that 52% of the

repair actions were required, 21% recommended or optional and 27% unnecessary. Out of every repair dollar, 47 cents was spent on necessary repairs, 53 cents on unnecessary repair. Chances of overrepair turned out to be 25% for brakes, 19% for suspensions, 78% for engines, and 39% overall. Chances of underrepair were 11% for brakes, 31% for suspensions, 28% for engines, and 21% overall.

Department of Transportation, Office of Assistant Secretary for Governmental and Public Affairs, Washington, D.C. 20590; Johnson Center for Environmental and Energy Studies, Univ. Alabama in Huntsville, P.O. Box 1247, Huntsville, Ala. 35807
DOT-OS-9-0004

Publ: U.S. Department of Transportation News (7 May 1979)
Rept. No. DOT-57-79; 1979; 72p

Includes news release.

Availability: Corporate author

HS-805 025

AN EXPERIMENTAL STUDY OF HIGHWAY AERODYNAMICS INTERFERENCES. FINAL REPORT

The aerodynamic forces of interference between two vehicles (conventional passenger cars and articulated trucks) were investigated experimentally in the Virginia Polytechnic Institute tank and wind tunnels. The results are qualitative, indicating order of magnitude of the expected forces and moments. Data match with reasonable accuracy those of earlier tests performed to simulate the passing process in the presence of a strong crosswind, the drag coefficient increased sharply almost twice its undisturbed value during the period the passenger car was about to clear the leading boundary of the truck. The relative importance of different lateral and yaw separations for the passenger car and the disturbing vehicle was evaluated, as well as the effects of various tractor shapes. Static and dynamic experiments demonstrated that dynamic effects were not significant. The data obtained from static tests may depart from more accurate data by 10%. Tests performed with opposite crossings in much higher absolute changes of the aerodynamic coefficients and their slopes, although the effect of fixed obstacles on any vehicles is insignificant. A truck approaching a passenger vehicle in the opposite direction eventually generates side forces of the order of 35% of the drag. More significantly, these change sign during the passing process and become attractive. It was revealed that the critical area occurs near the front of the truck cab for both the parallel passing and the opposite passing. Overshoots of 50% to 100% of the aerodynamic coefficients are encountered in very short periods of time. A further investigation of these phenomena and of the stability of such vehicles is recommended before such vehicles are permitted to be marketed.

by D. P. Telionis; C. J. Fahrner; G. S. Jones
Virginia Polytechnic Inst. and State Univ., Blacksburg, Va. 24061

DOT-HS-7-01590

1978; 82p 20refs

Rept. for Apr 1977-Oct 1978.

Availability: NTIS

HS-805 027

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES, VOL. 2, NO. 1

Case summaries are presented of recent in-depth reports compiled by National Hwy. Traffic Safety Administration

Multidisciplinary Accident Investigation Teams in a continuing series of publications. These case reports are individual, clinical studies of accidents of fatal, injury-producing, or property-damage severity (severe enough so that at least one vehicle must be towed from the scene), generally involving vehicles of the last three model years. The Teams investigate each accident in-depth, concerning themselves with each element of the collision (human, vehicle, environment) as it interacts with each phase of the collision (pre-crash, crash, post-crash). Each of the summaries consists of identification information, basic information on the highway and vehicles involved, a description of the driver and occupants involved (with their injuries), a phase-by-phase description of the sequence of events of the collision, and a list of causal factors, conclusions and recommendations. A diagram of each collision is included.

National Hwy. Traffic Safety Administration, National Center for Statistics and Analysis, Washington, D.C. 20590
1979; 471p refs
Availability: NTIS

HS-805 031

IMPROVED HYBRID COMPUTER VEHICLE HANDLING PROGRAM. FINAL REPORT

The Improved Hybrid Computer Vehicle Handling Program is an extension of the Hybrid Computer Handling Program (HVHP). The computing tasks have been redistributed between the analog and digital computers. Many of the simplifications that existed in the HVHP have been removed. The equations of motion for the sprung and unsprung masses of a vehicle have been expanded to include higher order terms and large pitch and roll angles. Numerous geometric and kinematic calculations have been modified to include large pitch and roll angles. The hybrid computer simulation for vehicle handling studies, in use for six years, can simulate independent front and rear axles, independent front with solid rear axle, independent front and solid rear axle with dual rear tires, solid front and rear axles, and solid front and rear axles with dual rear tires. For validation purposes, braking, steering, and combinations of braking and steering were put into the simulated mathematical model; the simulation time histories were then compared to full-scale test data. The hybrid vehicle handling program can be used for general studies of vehicle dynamics. Performance of the National Hwy. Traffic Safety Administration standard passenger car Vehicle Handling Test Procedures and calculation of the associated performance comparison variables are simulation options. A special interactive user's interface allows program use by vehicle engineers as well as by computer specialists.

by P. F. Bohn; R. J. Kennan
Johns Hopkins Univ., Applied Physics Lab., Johns Hopkins Rd., Laurel, Md. 20810
DOT-AS-20029
Rept. No. APL/JHU-CP-049A; 1978; 362p 21refs
Rept. for Jul 1976-Oct 1978. See also HS-802 059, Hybrid Computer Handling Program.
Availability: NTIS

HS-805 081

ADVANCED RECORDER DESIGN DEVELOPMENT. FINAL REPORT

The history behind the design, building, and testing of an advanced automotive crash recorder (Model 44400) is related. The program produced a reasonably accurate and reliable device which records and stores two axes of horizontal acceleration

data experienced by a vehicle during a crash. A target cost of \$50.00 per unit in quantities of 50,000 units and ease of installation were other design requirements that were met. In addition, the program tasks generated a device to retrieve the recorded data, a minicomputer system to establish a crash recorder data bank, and an implementation plan. Recommendations are made for future improvements.

by J. R. Sherwin; J. D. Kerr
Teledyne - Geotech, 3401 Shiloh Rd., Garland, Tex. 75041
DOT-HS-7-01641
Rept. No. TR-79-7; 1979; 45p
Rept. for Jul 1977-Apr 1979.
Availability: NTIS

HS-805 121

NATIONAL SYMPOSIUM ON COMMERCIAL TRUCK EXPOSURE ESTIMATION. VOL. 1: SUMMARY. FINAL REPORT

An overview is presented of the symposium held 9-11 Apr 1979, attended by 80 persons. Vol. 2 of the report contains the proceedings, which include 22 formal presentations. The symposium objectives are outlined: to discuss the needs for commercial truck exposure estimation programs; to consider the current status of these programs; to consider new programs (local, state, and national); to identify new techniques or methodologies to be used in such programs; and to provide a forum for discussion. Procedures used prior to and during the symposium are explained, and conclusions and recommendations are summarized. Among the principal recommendations is greater coordination among Federal agencies to establish an integrated data gathering and retrieval system for commercial truck exposure information.

by Martin L. Reiss
Institute for Safety Analysis, 6400 Goldsboro Rd., Washington, D.C. 20034
DOT-HS-8-02046
Rept. No. 9968-2; 1979; 16p
Rept. for Oct 1978-Jun 1979. Vol. 2 is HS-805 122.
Availability: NTIS

HS-810 345

STATEMENT BEFORE THE SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATIONS, HOUSE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE, CONCERNING THE SAFE DESIGN AND USE OF CHILD RESTRAINTS, MAY 7, 1979

Despite the fact that auto accidents are the leading killer of children aged 5 to 9, 93% of young children ride without any type of occupant restraint device. Close to 1000 children under the age of 5 die in car accidents each year, and as many as 100 times that number are injured. A leading danger to child passengers is the second collision, the contact between the unrestrained occupant and the vehicle interior. A child's high center of gravity and delicate bone structure make him especially susceptible to injury. Children, particularly infants, cannot be restrained sufficiently by adult restraints. There are a variety of effective child restraint designs commercially available (harness-type devices, infant carriers, and child seating systems), all of which require proper use. The National Hwy. Traffic Safety Administration (NHTSA) has proposed improvements in Federal Motor Vehicle Safety Standard 213 by replacing static test criteria with a dynamic test more reflective of real-world conditions. The proposal would promote effective restraint use by ensuring adequate labeling and instructions. Because of the in-

creased costs involved with improved restraints, NHTSA is encouraging economic measures such as loan-a-seat programs. Other NHTSA activities include study of means to make the vehicle rear seat safer for children, encouragement of manufacturers to supply built-in top tether anchorages in vehicles, and active involvement in an effort to increase public familiarity with child restraint use (workshops, brochures, booklets, films, radio and TV announcements). Some states (e.g. Michigan) have used 402 funds for initiating voluntary child restraint programs; Tennessee is the first state to pass a child restraint usage law.

by Joan Claybrook
National Hwy. Traffic Safety Administration, Washington, D.C.
20590
1979; 10p
Availability: Corporate author

HS-810 346

STATEMENT BEFORE THE SUBCOMMITTEE ON ECONOMIC STABILIZATION, SENATE COMMITTEE ON BANKING, HOUSING AND URBAN AFFAIRS, CONCERNING THE EFFECT OF REGULATION ON THE AUTOMOTIVE INDUSTRY, APRIL 26, 1979

In terms of the corporate average fuel economy standards, the requirements for passenger cars through model year 1985, and for light trucks through model year 1981, correspond to a reduction of 220 billion gallons of gasoline from 1978 through 1990, a savings of \$60 billion in imported fuel costs. At \$.80/gal, an average net lifetime savings of \$700 for each 1985 model car and 1981 model light truck is projected. It is recognized that improvement of fuel economy requires new levels of commitment from the auto industry and its suppliers, but the National Hwy. Traffic Safety Administration (NHTSA), through extensive and detailed economic analyses, has concluded that the fuel economy standards can be met in an economically practicable way by the industry. Ford Motor Co. and General Motors Corp. have requested a lowering of the standards for 1981-1984 model year cars to make them more cost effective; NHTSA is currently evaluating their request. NHTSA is also considering a request by Chrysler Corp. to reduce standards for 1981 model light trucks. The Dept. of Energy and the Environmental Protection Agency have had close coordination with NHTSA on the establishment of the 1981-1984 passenger car fuel economy standards; account was taken of the impact of all other existing and scheduled automobile requirements.

by Howard J. Dugoff
National Hwy. Traffic Safety Administration, Washington, D.C.
20590
1979; 6p
Availability: Corporate author

HS-810 348

STATEMENT TO THE SENATE COMMERCE COMMITTEE OF THE WISCONSIN LEGISLATURE, FEBRUARY 9, 1977 [MOTORCYCLE HELMET USE]

The National Hwy. Traffic Safety Administration (NHTSA) refutes claims that a national motorcycle safety standard places unwarranted restrictions on the motorcycling industry or sport, that mandatory helmet use laws are unconstitutional, that helmets impair vision and hearing, and that helmets increase neck injuries. A 1974 study by NHTSA of more than 5600 motorcycle accidents showed that Illinois (no helmet law) accidents resulted in 3 times more fatal or serious head injuries, 2 times

more head injuries of lesser severity, and 2 1/2 times more head injuries overall than comparable Michigan (helmet law) accidents. The study also pointed out that less than 30% of riders wear a helmet when it is not required by law. A 1975 survey by the Insurance Inst. for Hwy. Safety found that helmet usage was 98% among 1000 observed cyclists in Georgia and Maryland (helmet laws) vs. 62% (of 1338 riders) in California and 25% (of 504) in Illinois (no helmet laws). A 1967 survey of 4 motorcyclists and 400 car drivers in Wisconsin showed 62% and 98%, respectively, in favor of compulsory helmet use. A survey of motorcyclists involved in accidents in Idaho in 1974 found that 77% were in favor of a mandatory helmet law. Improved driver licensing and safety education programs will help prevent motorcycle crashes, but they cannot be considered as alternatives to helmet use.

by Lewis S. Buchanan
National Hwy. Traffic Safety Administration, Washington, D.C.
20590
1977; 10p 4refs
Availability: Corporate author

HS-810 349

STATEMENT TO THE HOUSE TRANSPORTATION COMMITTEE OF THE NEW HAMPSHIRE LEGISLATURE, MARCH 17, 1977 [MOTORCYCLE HELMET USE]

The National Hwy. Traffic Safety Administration (NHTSA) refutes claims that a national motorcycle safety standard places unwarranted restrictions on the motorcycling industry or sport, that mandatory helmet use laws are unconstitutional, that helmets impair vision and hearing, and that helmets increase neck injuries. A 1974 study by NHTSA of more than 5600 motorcycle accidents showed that Illinois (no helmet law) accidents resulted in 3 times more fatal or serious head injuries, 2 times more head injuries of lesser severity, and 2 1/2 times more head injuries overall than comparable Michigan (helmet law) accidents. The study also pointed out that less than 30% of riders wear a helmet when it is not required by law. A 1975 survey by the Insurance Inst. for Hwy. Safety found that helmet usage was 98% among 1000 observed cyclists in Georgia and Maryland (helmet laws) vs. 62% (of 1338 riders) in California and 25% (of 504) in Illinois (no helmet laws). A 1967 survey of 4 motorcyclists and 400 car drivers in Wisconsin showed 62% and 98%, respectively, in favor of compulsory helmet use. A survey of motorcyclists involved in accidents in Idaho in 1974 found that 77% were in favor of a mandatory helmet law. A survey in Missouri of 191 motorcyclists found that 69% supported the state's helmet law. Improved driver licensing and safety education programs will help prevent motorcycle crashes, but they cannot be considered as alternatives to helmet use.

by Lewis S. Buchanan
National Hwy. Traffic Safety Administration, Washington, D.C.
20590
1977; 10p 4refs
Availability: Corporate author

HS-810 350

STATEMENT TO THE JOINT LEGISLATIVE COMMITTEE ON HIGHWAY SAFETY OF THE RHODE ISLAND LEGISLATURE, APRIL 14, 1977 [MOTORCYCLE HELMET USE]

The National Hwy. Traffic Safety Administration (NHTSA) refutes claims that a national motorcycle safety standard

December 31, 1979

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unwarranted restrictions on the motorcycling industry or sport, that mandatory helmet use laws are unconstitutional, that helmets impair vision and hearing, and that helmets increase neck injuries. A 1974 study by NHTSA of more than 5600 motorcycle accidents showed that Illinois (no helmet law) accidents resulted in 3 times more fatal or serious head injuries, 2 times more head injuries of lesser severity, and 2 1/2 times more head injuries overall than comparable Michigan (helmet law) accidents. Data indicate that less than one-third of all motorcyclists involved in accidents are wearing helmets when usage is not required by law. Observational surveys of helmet use generally show a slightly higher rate for non-accident-involved riders. On the other hand, the use rate in states with helmet laws appears to be very high. Surveys conducted in Wisconsin, Idaho, Missouri, and Utah have indicated that the majority of motorcyclists do not oppose helmet laws. A fifth survey by "Road Rider" magazine (1975) found that only 12.6% of the readers surveyed favored mandatory helmet use, reflective of the opinion of a narrow segment of motorcyclists. Each state needs a well-funded, comprehensive motorcycle safety program incorporating the best techniques in safety education, driver licensing, accident analysis, improved conspicuity, public education, and helmet use.

by Lewis S. Buchanan
National Hwy. Traffic Safety Administration, Washington, D.C.
20590
1977; 11p 5refs
Availability: Corporate author

HS-810 351

**STATEMENT TO THE SENATE TRANSPORTATION
COMMITTEE OF THE SOUTH CAROLINA
LEGISLATURE, MAY 4, 1977 [MOTORCYCLE
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The National Hwy. Traffic Safety Administration (NHTSA) refutes claims that a national motorcycle safety standard places unwarranted restrictions on the motorcycling industry or sport, that mandatory helmet use laws are unconstitutional, that helmets impair vision and hearing, and that helmets increase neck injuries. A 1974 study by NHTSA of more than 5600 motorcycle accidents showed that Illinois (no helmet law) accidents resulted in 3 times more fatal or serious head injuries, 2 times more head injuries of lesser severity, and 2 1/2 times more head injuries overall than comparable Michigan (helmet law) accidents. Data indicate that less than one-third of all motorcyclists involved in accidents are wearing helmets when usage is not required by law. Observational surveys of helmet use generally show a slightly higher rate for non-accident-involved riders. On the other hand, the use rate in states with helmet laws appears to be very high. Surveys conducted in Wisconsin, Idaho, Missouri, and Utah have indicated that the majority of motorcyclist do not oppose helmet laws. A fifth survey by "Road Rider" magazine (1975) found that only 12.6% of the readers surveyed favored mandatory helmet use, reflective of the opinion of a narrow segment of motorcyclists. Each state needs a well-funded, comprehensive motorcycle safety program incorporating the best techniques in safety education, driver licensing, accident analysis, improved conspicuity, public education, and helmet use.

by Lewis S. Buchanan
National Hwy. Traffic Safety Administration, Washington, D.C.
20590
1977; 11p 5refs
Availability: Corporate author

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**Johnson Center for Environmental and Energy Studies,
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Mich. 48913**

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HS-026 267

**Ministry of Transport, Road Transport Div., Private Bag,
Wellington, New Zealand**

A COMPARISON OF INJURY MOTOR ACCIDENTS IN
OTARA AND GLENFIELD [NEW ZEALAND]

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**Ministry of Transportation and Communications,
Commercial Vehicles Operations and Safety, 1201 Wilson
Ave., Downsview, Ont., M3M 1J8 Canada**

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**Monash Univ., Human Factors Group, Wellington Rd.,
Clayton, Vic. 3168, Australia**

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SCHOOL CHILDREN

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MITRE Corp., Metrek Div., McLean, Va.

AUTOMOBILE FUEL EFFICIENCY SEMINAR, MAY
11, 1978, WASHINGTON, D.C. VOL. 1. SUMMARY OF
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AUTOMOBILE FUEL EFFICIENCY SEMINAR, MAY
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**National Aeronautics and Space Administration, Langley
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RIDE QUALITY CRITERIA OF MULTIFACTOR ENVI-
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**National Hwy. Traffic Safety Administration, National
Center for Statistics and Analysis, Washington, D.C.
20590**

THE NATIONAL ACCIDENT SAMPLING SYSTEM. A
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THE NATIONAL ACCIDENT SAMPLING SYSTEM. A
STATUS REPORT. VOL. 2: PLAN FOR A PILOT
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THE NATIONAL ACCIDENT SAMPLING SYSTEM. A
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**National Hwy. Traffic Safety Administration, Office of
Automotive Fuel Economy Standards, Washington, D.C.
20590**

THE OUTLOOK FOR FUEL ECONOMY IMPROVE-
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**National Hwy. Traffic Safety Administration, Technical
Reference Div., Washington, D.C. 20590**

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**National Hwy. Traffic Safety Administration, Traffic
Safety Programs, Washington, D.C. 20590**

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**National Hwy. Traffic Safety Administration, Washington,
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- National Telecommunications and Information Administration, Inst. for Telecommunication Sciences, Boulder, Colo. 80303
EMERGENCY MEDICAL SERVICES COMMUNICATIONS SYSTEM TECHNICAL PLANNING GUIDE
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- National Transportation Safety Board, Office of the Managing Director, Washington, D.C. 20594
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- SAFETY EFFECTIVENESS EVALUATION OF THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION'S PASSIVE RESTRAINT EVALUATION PROGRAM
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- New England Instrument Co., Res. and Devel. Dept., Natick, Mass.
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- North Carolina State Univ., Dept. of Mathematics, Raleigh, N.C.
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AN ALTERNATIVE APPROACH TO AUTOMOTIVE FUEL GAUGING
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- Pennsylvania State Univ., Pennsylvania Transportation Inst., University Park, Pa.
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- Pennsylvania State Univ., Pennsylvania Transportation Inst., Human Factors Res. Prog., Res. Bldg. B, University Park, Pa. 16802
PERIPHERAL VISION AND DRIVING
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- Prince Georges General Hosp.
ANATOMY AND TRAUMA OF THE CERVICAL SPINAL CORD
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- CERVICAL FRACTURES AND FRACTURE DISLOCATIONS--AN OVERVIEW
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- CERVICAL FRACTURES AND FRACTURE-DISLOCATIONS SUSTAINED WITHOUT HEAD IMPACT
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- Purdue Univ., Joint Hwy. Res. Proj., West Lafayette, Ind. 47907
TRAFFIC SPEED REPORT NO. 107. INTERIM REPORT, OCTOBER - DECEMBER 1978 [INDIANA HIGHWAYS]
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- R. J. Hansen Associates, Inc., Rockville, Md.
STATE LAWS AND REGULATIONS ON TRUCK SIZE AND WEIGHT
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A NEW CONCEPT IN CHILD RESTRAINT DESIGN
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USE OF ADULT BELT BY CHILD; A NEW CONCEPT
HS-026 215
- Riddell, Inc.
X-RAY STUDY OF THE HUMAN NECK DURING VOLUNTARY MOTION
HS-026 184

December 31, 1979

Road Safety and Traffic Authority, Australia
EFFECTS OF THE VICTORIAN CHILD RESTRAINT
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**Road Safety Information Service, Office of Road Safety,
Australia**
PRESENT SITUATION OF AUSTRALIAN LEGISLA-
TION COVERING CHILD RESTRAINTS

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Rochester General Hosp.
SOFT TISSUE INJURIES OF THE NECK

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**Royal Australasian Coll. of Surgeons, Road Trauma Com.,
Coll. of Surgeons' Gardens, Spring St., Melbourne 3000,
Vic., Australia**

RESTRAINING THE CHILD IN A CAR. SEMINAR
CONDUCTED BY THE ROAD TRAUMA COMMITTEE
OF THE ROYAL AUSTRALASIAN COLLEGE OF SUR-
GEONS, MELBOURNE, AUSTRALIA, ON 1ST APRIL,
1978

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PRACTICAL ASPECTS OF CHILD RESTRAINT
SYSTEM USE

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**Royal Melbourne Inst. of Tech., Mechanical Engineering
Dept., Melbourne, Vic., Australia**
THE FITTING OF CHILD RESTRAINTS INTO VEHI-
CLES. DR. PETER ARNBERG EXPERIMENTS, MEL-
BOURNE, FEBRUARY/MARCH 1978

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**Smiths Industries Ltd., Vehicle Instrumentation Div.
(London, England)**
ELECTRONIC INSTRUMENTATION--LUMINOUS DIS-
PLAYS AND THEIR DRIVE CIRCUITS

HS-026 052

**Society of Automotive Engineers, Inc., 400 Commonwealth
Drive, Warrendale, Pa. 15096**
THE HUMAN NECK--ANATOMY, INJURY MECHA-
NISMS AND BIOMECHANICS

HS-026 179

AUTOMOTIVE SENSORS

HS-026 235

**Society of Automotive Engineers, 400 Commonwealth
Drive, Warrendale, Pa. 15096**
SURFACE VEHICLE SOUND MEASUREMENT PRO-
CEDURES. HANDBOOK SUPPLEMENT. 1979 ED.

HS-026 178

South Coast Technology, Inc., Santa Barbara, Calif.
FUEL ECONOMY OF ALTERNATIVE AUTOMOTIVE
ENGINES. LEARNING CURVES AND PROJECTIONS

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Stanford Univ.
A CYLINDER PRESSURE SENSOR FOR SPARK AD-
VANCE CONTROL AND KNOCK DETECTION

HS-026 237

**Swiss Federal Inst. of Tech. Zurich, Dept. of Behavioral
Science, Zurich, Switzerland**
EYE MOVEMENTS BEHAVIOR WHILE DRIVING A
CAR: A REVIEW. PROGRESS REPORT NO. 1

HS-026 149

Systems Control, Inc.
A CYLINDER PRESSURE SENSOR FOR SPARK AD-
VANCE CONTROL AND KNOCK DETECTION

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Teledyne - Geotech, 3401 Shiloh Rd., Garland, Tex. 75041
ADVANCED RECORDER DESIGN DEVELOPMENT.
FINAL REPORT

HS-805 081

Transport Canada, Road Safety Unit
PORTABLE INTERACTIVE DATA ACQUISITION
AND ANALYSIS SYSTEM FOR DRIVER BEHAVIOR
RESEARCH

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**Transportation Res. Board, 2101 Constitution Ave., N.W.,
Washington, D.C. 20418**
ACCIDENT ANALYSIS, RIDE QUALITY, DRIVER
EDUCATION, AND BEHAVIOR RESEARCH

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**Transportation Systems Center, Energy Programs Div.,
Cambridge, Mass.**
RESOURCE IMPACTS OF ALTERNATIVE AUTO-
MOBILE DESIGN TECHNOLOGIES

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**University of Alabama in Huntsville, Environmental and
Energy Center**
CONSUMER COSTS OF UNNECESSARY AUTO-
MOBILE REPAIRS

HS-026 202

**University of Kansas Coll. of Health Sciences, Emergency
Medical Training Prog., 39th at Rainbow Blvd., Kansas
City, Kans. 66103**
IMPACT OF THE REPEAL OF THE KANSAS MAN-
DATORY MOTORCYCLE HELMET LAW. AN EXECU-
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University of Michigan Medical School
CERVICAL FRACTURES AND FRACTURE DISLOCA-
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University of Michigan, Hwy. Safety Res. Inst.
CERVICAL FRACTURES AND FRACTURE DISLOCA-
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University of Michigan, Hwy. Safety Res. Inst.
BIOMECHANICAL ANALYSIS OF SWIMMING POOL
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HUMAN NECK INJURY TOLERANCE

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IMPACT SLED TEST EVALUATION OF RESTRAINT
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HSL

University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48109

THE EFFECT OF THE NO-FAULT AUTOMOBILE INSURANCE LAW ON ROAD COMMISSION LIABILITY FOR DEFECTIVE ROADS. SPECIAL REPORT

HS-026 135

THE EFFECT OF THE NO-FAULT AUTOMOBILE INSURANCE LAW ON ROAD COMMISSION VEHICLES AND EQUIPMENT. SPECIAL REPORT

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VEHICLE HANDLING STUDY: AN ASSESSMENT OF TIRE CONDITIONS. FINAL REPORT

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University of Michigan, Hwy. Safety Res. Inst., Biomedical Dept., Ann Arbor, Mich.

AN EVALUATION OF ADULT CLASPING STRENGTH FOR RESTRAINING LAP-HELD INFANTS

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University of Michigan, Hwy. Safety Res. Inst., Policy Analysis Div., Ann Arbor, Mich. 48109

CIVIL AND CRIMINAL LIABILITY OF ROAD COMMISSION EMPLOYEES

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University of North Carolina at Chapel Hill, Hwy. Safety Res. Center

METHODOLOGY FOR RANKING ROADSIDE HAZARD CORRECTION PROGRAMS

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University of Rochester School of Medicine and Rochester General Hosp.

CERVICAL FRACTURES AND FRACTURE-DISLOCATIONS SUSTAINED WITHOUT HEAD IMPACT

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BIOMECHANICAL ANALYSIS OF SWIMMING POOL NECK INJURIES

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University of Rochester School of Medicine
SOFT TISSUE INJURIES OF THE NECK

HS-026 185

University of Southern California, Traffic Safety Center, University Park, Los Angeles, Calif. 90007

MOTORCYCLE ACCIDENT CAUSE FACTORS AND IDENTIFICATION OF COUNTERMEASURES. STATUS REPORT OF ACCIDENT INVESTIGATION DATA. PRELIMINARY REPORT.

HS-804 096

University of Utah, Dept. of Mechanical and Industrial Engineering, Salt Lake City, Utah 84112

THE EFFECT OF MOTORCYCLE HELMETS ON HEARING AND THE DETECTION OF WARNING SIGNALS

HS-026 229

Vehicle Equipment Safety Commission, Replacement VIN Com.

PROPOSED NATIONAL STANDARDIZATION, REPLACEMENT VEHICLE IDENTIFICATION NUMBER SYSTEM

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Vehicle Equipment Safety Commission, Sun Screening Com.

PROPOSED NATIONAL STANDARDIZATION OF MOTOR VEHICLE SUN SCREENING DEVICES

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Virginia Polytechnic Inst. and State Univ., Blacksburg, Va. 24061

AN EXPERIMENTAL STUDY OF HIGHWAY DYNAMICS INTERFERENCES. FINAL REPORT

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Wayne State Univ.

EVALUATION OF HIGHWAY SAFETY PROGRAMS USING QUALITY-CONTROL TECHNIQUE

HS-C

Wisconsin Dept. of Public Instruction, Div. for Handicapped Children

IMPACT SLED TEST EVALUATION OF RESTRAINT SYSTEMS USED IN TRANSPORTATION OF HANDICAPPED CHILDREN

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DAERO-78-G-018

Swiss Federal Inst. of Tech. Zurich, Dept. of Behavioral Science, Zurich, Switzerland

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DOE-EY-76-C-02-3077

North Carolina State Univ., Dept. of Mathematics, Raleigh, N.C.

HS-026 047

DOE-W-7405-Eng-48

North Carolina State Univ., Dept. of Mathematics, Raleigh, N.C.

HS-026 047

DOT-AS-20029

Johns Hopkins Univ., Applied Physics Lab., Johns Hopkins Rd., Laurel, Md. 20810

HS-805 031

DOT-FH-11-9240

Beiswenger, Hoch and Associates, Inc., P.O. Box 600028, North Miami Beach, Fla. 33160

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DOT-HS-RA-77-07

Department of Energy, Bartlesville Energy Technology Center, P.O. Box 1398, Bartlesville, Okla. 74003

HS-804 016

DOT-HS-5-01160

University of Southern California, Traffic Safety Center, University Park, Los Angeles, Calif. 90007

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DOT-HS-7-01551

Calspan Advanced Technology Center, P.O. Box 400, Buffalo, N.Y. 14225

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Calspan Advanced Technology Center, P.O. Box 400, Buffalo, N.Y. 14225

HS-804 320

DOT-HS-7-01563

University of Kansas Coll. of Health Sciences, Emergency Medical Training Prog., 39th at Rainbow Blvd., Kansas City, Kans. 66103

HS-803 959

DOT-HS-7-01577

Allen Corp. of America, 517 S. Washington St., Alexandria, Va. 22314

HS-803 993

DOT-HS-7-01590

Virginia Polytechnic Inst. and State Univ., Blacksburg, Va. 24061

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DOT-HS-7-01641

Teledyne - Geotech, 3401 Shiloh Rd., Garland, Tex. 75041

HS-805 081

DOT-HS-8-02046

Institute for Safety Analysis, 6400 Goldsboro Rd., Washington, D.C. 20034

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DOT-OS-9-0004

Department of Transportation, Office of Assistant Secretary for Governmental and Public Affairs, Washington, D.C.

20590; Johnson Center for Environmental and Energy Studies, Univ. of Alabama in Huntsville, P.O. Box 1247, Huntsville, Ala. 35807

HS-804 355

DOT-TSC-1047

Arthur D. Little, Inc., Automotive Technology Group, Acorn Park, Cambridge, Mass. 02140

HS-803 655

DOT-TSC-1081

Crain and Associates, 1145 Merrill St., Menlo Park, Calif. 94025

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HPR-1(16)

Purdue Univ., Joint Hwy. Res. Proj., West Lafayette, Ind. 47907

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MVMA-361122

University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48109

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University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48109

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University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48109

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University of Michigan, Hwy. Safety Res. Inst., Policy Analysis Div., Ann Arbor, Mich. 48109

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CONTRACTS AWARDED

DOT-HS-020-2-2901A Mod. 8

STANDARDS DEVELOPMENT

Continued technical support shall be provided for the Breath Alcohol Instrument Evaluation Program. Procedures shall be developed for inclusion in the breath alcohol tester standards which will require quantitative determination of the response of a breath tester to acetone. The new standard will use a breath alcohol simulator in lieu of human test subjects for qualification testing; appropriate modifications of the standards and test procedures shall be developed. A standard compliance information system shall be developed.

National Bureau of Standards, Law Enforcement Standards
Laboratory, Washington, D.C. 20034
Increased \$45,500.00
Extended to 31 Jul 80

DOT-HS-7-01580 Mod. 4

PEDESTRIAN INJURY CAUSATION PARAMETERS

Additional medical data (includes copies of original X-rays or 35 mm slides of the X-rays, and diagnoses of attending physicians) shall be collected on pedestrian accidents meeting the following criteria: nonfatal pedestrians, frontal collisions, passenger cars, and resulting in injuries to the lower extremities and/or pelvic body regions (Abbreviated Injury Scale 2-5).

Southwest Research Institute, 8500 Culebra Road, San Antonio,
Texas 78284
Increased \$4143.00
No change

DOT-HS-7-01724 Mod. 4

LOW BEAM SHAPING FOR IMPROVED WIDE ANGLE ROADWAY ILLUMINATION

Data obtained shall be reanalyzed to examine the effects of headlamp illumination on driver performance for each subject individually and for each critical roadway curve separately. A determination shall be made of whether there are any measures which describe in a consistent manner the effect of the different levels of headlamp illumination on driver behavior in negotiating curves. Using such measures, the effects of increased angular dispersion of the low beam on driver performance shall be investigated.

Human Factors Research, Inc., 5775 Dawson Avenue, Goleta,
California 93017
Increased \$16,484.00
Extended to 2 Nov 79

DOT-HS-8-01999 Mod. 1

METHODS FOR ESTIMATING EXPECTED BLOOD ALCOHOL CONCENTRATION

An improved method shall be developed for estimating the blood alcohol concentration based on alcohol intake, body weight, and food consumption.

Southern California Research Institute, 6305 Arizona Place, Los
Angeles, California 90045
Increased \$9299.00
Extended to 30 Jun 80

DOT-HS-9-02148

RESURFACING OF SKID SURFACES AT UNIFORM TIRE QUALITY GRADING FACILITY, SAN ANGELO, TEXAS 76902

The asphalt skid pads at the Research and Testing Center, Uniform Tire Quality Grading Facility, San Angelo, Texas, shall be resurfaced using a supplied asphalt mix design. Existing side slopes must be maintained for proper water drainage and skid system stabilization. The total pad area to be resurfaced is approximately 800 ft x 70 ft including ramps. Broken or damaged areas in the skid track pavement approaches and connecting roads shall be repaired by removing damaged pavement material and refilling with asphalt hot mix using established procedures for compacting and smoothing. The skid test circuit (1.4 mi), except concrete and asphalt pads proper, shall be seal-coated. A rotary brush-equipped tractor and operator shall be furnished to assist in cleaning and burnishing of finished skid pad.

Reece Albert, Inc., 3001 Foster Street, San Angelo, Texas 76903
\$60,680.60
5 Apr thru 8 Apr 79

DOT-HS-9-02195

SURVEY OF OWNERS OF MOTOR VEHICLES FOR SAFETY RELATED DEFECTS

Per Task Order, safety-related defects (SRD) investigation data shall be obtained for particular makes, models, and model years of motor vehicles from residents of California, Colorado, Florida, Georgia, Illinois, Missouri, New York, Ohio, Tennessee, and Texas. Questionnaires (standard or new design, where necessary) shall be sent to vehicle owners selected in accordance with the principles of probability random sampling. The data received shall be codified and analyzed. All new information shall be integrated with previous data for comparison, where pertinent. As requested by the Office of Defects Investigation, National Highway Traffic Safety Administration, a comprehensive analysis of the SRD data received shall be written

R. L. Polk and Co., 6400 Monroe Blvd., Taylor, Michigan
48180
\$25,000.00
To be completed by 30 Sep 80

DOT-HS-9-02233

ESTABLISHMENT AND OPERATION OF ZONE CENTER A (SOUTHERN ZONE) FOR NASS

The following work shall be conducted for Zone A of the National Accident Sampling System (NASS): provide primary technical guidance to PSU (primary sampling unit) teams; maintain a formal, systematic, and continuing organization for quality-control activities; establish timely and thorough reporting procedures to the National Center for Statistics and Analysis (NCSA); assist NCSA in the development and maintenance of NASS; conduct semiannual Zone Center seminars; keypunch the Special Study Data for PSU's within Zone A; train new Zone Centers in all activities; and provide administrative support of PSU teams.

DOT-HS-9-02248

Indiana University Foundation, 355 Lansing Street, Indianapolis, Indiana 46202
\$962,486.00
To be completed by 30 Jul 82

DOT-HS-9-02248

COMPLIANCE TESTING MOTOR-DRIVEN CYCLES AND MOTORCYCLES

Motor-driven cycles and motorcycles shall be inspected and tested in accordance with applicable sections of Federal Motor Vehicle Safety Standard Nos. 108, 111, 119, 120, 122 (Lamps, Reflective Devices, and Associated Equipment; Rearview Mirrors; New Pneumatic Tires; Tire Selection and Rims for Vehicles Other than Passenger Cars; Motorcycle Brake Systems--Motorcycles; and Motorcycle Controls and Displays) and Regulation Parts 567, 571 and 574 (Certification Regulation; Federal Motor Vehicle Safety Standards; and Tire Identification and Record Keeping).

Mobility Systems and Equipment Co., 6151 W. Century Blvd., Suite 912, Los Angeles, CA 90045
Per Delivery Order
To be completed one (1) year from date of contract award (25 Sep 79)

DOT-HS-9-02252

LAMPS, REFLECTIVE DEVICES AND ASSOCIATED EQUIPMENT

Lamps, operating units, and flashers shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 108 (Lamps, Reflective Devices and Associated Equipment), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-108-08 dated 20 Apr 79.

Industrial Testing Laboratories, 3813 Eighth Street, Berkeley, California 94710
Per Delivery Order
To be completed one (1) year from date of contract award (28 Sep 79)

DOT-HS-9-02253

LAMPS, REFLECTIVE DEVICES AND ASSOCIATED EQUIPMENT

Lamps, operating units, and flashers shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 108 (Lamps, Reflective Devices and Associated Equipment), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-108-08 dated 20 Apr 79.

Ball Aerospace Systems Division, Post Office Box 1062, Boulder, Colorado 80306
Per Delivery Order
To be completed one (1) year from date of contract award

DOT-HS-9-02254

LAMPS, REFLECTIVE DEVICES AND ASSOCIATED EQUIPMENT

Lamps, operating units, and flashers shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 108 (Lamps, Reflective Devices and Associated Equip-

HSL

ment), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-108-08 dated 20 Apr 79.

ETL Testing Laboratories, Inc., Industrial Park, Cortlandt, New York 13045
Per Delivery Order
To be completed one (1) year from date of contract award (25 Sep 79)

DOT-HS-9-02255

STUDY TO DETERMINE WHY VEHICLE OWNERS RESPOND TO OR IGNORE RECALL NOTIFICATIONS

A study shall be conducted of the influential factors and attitudes of vehicle owners involved in safety recall campaigns. They relate to campaign completion rates. The study shall take into account historic data of safety recall campaign completion rates since establishment of the National Highway Traffic Safety Administration in 1966, the effect of the 1974 Amendment to current data. The following two questions must be answered in this study: why certain vehicle owners respond to recall campaign notifications and get their cars fixed, and why certain vehicle owners do not respond to recall campaign notifications. Vehicle factors (age, foreign or domestic, classification of vehicle, range, use), owner personal factors, owner attitude factors, owner/dealer relationship factors, and defect type shall be considered. A questionnaire for mailing or phone interview shall be used to acquire data from owners of recalled vehicles.

Market Facts, Inc., 1750 K Street, N.W., Suite 1240, Washington, D.C. 20006
\$94,010.00
To be completed seven (7) months from date of contract award (17 Sep 79)

DOT-HS-9-02256

PARTNERSHIP DEVELOPMENT

A workshop/conference entitled, "Partnership Development" shall be arranged and conducted, the objective of which is to clarify the roles of the National Highway Traffic Safety Administration (NHTSA) Regions and NHTSA Traffic Safety Administration (TSP) personnel to develop effective partnership programs. The areas needing clarification are the roles of each, the authority of each, and relationships. This will be an organizational diagnosis for the partnership with particular concern for the regional interface. Goals of Partnership Development include solving problems, improving problem-solving and interpersonal skills, increasing understanding of organizations, and widening perspectives of organizational roles and responsibilities.

ODS Incorporated, 825 North Parkcenter Drive, Suite 200, Santa Ana, California 92701
\$22,000.00
To be completed by 21 Nov 79

DOT-HS-9-02259

EVALUATION OF CHILD RESTRAINT SYSTEM EFFECTIVENESS

Overall administration shall be provided for a survey to determine the effectiveness of alternative restraint systems in reducing the likelihood of nonminor injury to crash-involved motor vehicle occupants between the ages of 0 and 4. The children v

classified among four restraint usage categories (wearing an approved child restraint, properly tethered and buckled; improperly using an approved child restraint; using an adult restraint; and unrestrained). The percentage of children suffering nonminor injury will be calculated for each category. A total of 5000 to 10,000 cases need to be investigated in a minimum of three or four different states with an appropriate balance of urban and rural accidents. Data will be collected by medical and paramedical personnel in hospital emergency rooms, pediatricians' offices, or at the accident scene. Overall administration of the survey includes development of the common data form to be used by the participants; design and implementation of the sampling procedure; furnishing data forms, supplies, and instructions to each of the participating organizations; receiving completed data forms by mail; and data processing and analysis.

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."
\$272,509.00
To be completed by 30 Apr 81

DOT-HS-9-02265

ACCELERATOR CONTROL SYSTEMS

Passenger cars, multipurpose vehicles, pickup trucks, and trucks, tractors, and buses above 15,000 lb gross vehicle weight shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 124 (Accelerator Control Systems), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-124-04 dated 17 Jul 79.

Dayton T. Brown, Inc., Church Street, Bohemia, New York 11716
Per Delivery Order
To be completed one (1) year from date of contract award (21 Sep 79)

DOT-HS-9-02266

ACCELERATOR CONTROL SYSTEMS

Passenger cars, multipurpose vehicles, pickup trucks, and trucks, tractors, and buses above 15,000 lb gross vehicle weight shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 124 (Accelerator Control Systems), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-124-04 dated 17 Jul 79.

General Environments Corp., 5515 Cherokee Avenue, Alexandria, VA 22312
Per Delivery Order
To be completed one (1) year from date of contract award (24 Sep 79)

DOT-HS-9-02267

ACCELERATOR CONTROL SYSTEMS

Passenger cars, multipurpose vehicles, pickup trucks, and trucks, tractors, and buses above 15,000 lb gross vehicle weight shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 124 (Accelerator Control Systems), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-124-04 dated 17 Jul 79.

Dynamic Science, Inc., 1850 West Pinnacle Peak Rd., Phoenix, AZ 85027
Per Delivery Order
To be completed one (1) year from date of contract award (24 Sep 79)

DOT-HS-9-02268

TITLE VI TRAINING SEMINARS FOR STATE AND REGIONAL PERSONNEL

All logistics shall be planned and arranged for a series of three-day training seminars to instruct state and regional personnel of the National Highway Traffic Safety Administration (NHTSA) and personnel involved in NHTSA-funded programs, on the statutory and regulatory requirements of Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, and the Age Discrimination Act of 1975.

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."
\$98,000.00
To be completed six (6) months from date of contract award (26 Sep 79)

DOT-HS-9-02269

TRAFFIC LAW ADJUDICATION CURRICULUM DEVELOPMENT AND PROMOTION

Phase 1 (Materials Development) shall involve the development of a basic traffic law adjudication entry-level educational curriculum for judges who handle traffic cases, and the preparation of a marketing guide for use by Federal, state, and local officials in the organization, promotion, and administration of training courses to implement the curriculum. Phase 2 (Curriculum Promotion, Marketing, and Technical Assistance) shall entail the promotion and implementation of such training courses through regional workshops and technical assistance to a limited number of states and/or local jurisdictions. The curriculum will focus on the adjudication of the more serious traffic offenses with emphasis placed on the driver improvement potential of sanctioning alternatives and processes.

American Academy of Judicial Education, 1426 H Street, N.W., Suite 437, Woodward Building, Washington, D.C. 20005
\$149,094.00
To be completed eighteen (18) months from date of contract award (28 Sep 79)

DOT-HS-9-02273

WINDSHIELD MOUNTING, WINDSHIELD ZONE INTRUSION AND FUEL SYSTEM INTEGRITY (VEHICLE DYNAMIC CRASH TESTING)

Passenger cars, and multipurpose vehicles, trucks, and buses (under 6000 lb gross vehicle weight (GVW), and 6000 GVW to 10,000 GVW) shall be inspected and barrier impact tested (30 mph (frontal, oblique, and rear) and 20 mph (lateral)) in accordance with Federal Motor Vehicle Safety Standard Nos. 212 (Windshield Mounting), 219 (Windshield Zone Intrusion), and 301-75 (Fuel System Integrity), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-219-02 dated 9 Jan 79. A static rollover test shall be conducted after each barrier impact test

Approved Engineering Test Labs., 1536 East Valencia Dr., P.O. Box 4158, Fullerton, CA 92631
Per Delivery Order
To be completed one (1) year from date of contract award (24 Sep 79)

DOT-HS-9-02274

WINDSHIELD MOUNTING, WINDSHIELD ZONE INTRUSION, AND FUEL SYSTEM INTEGRITY (VEHICLE DYNAMIC CRASH TESTING)

Passenger cars, and multipurpose vehicles, trucks, and buses (under 6000 lb gross vehicle weight (GVW), and 6000 GVW to 10,000 GVW) shall be inspected and barrier impact tested (30 mph (frontal, oblique, and rear) and 20 mph (lateral)) in accordance with Federal Motor Vehicle Safety Standard Nos. 212 (Windshield Mounting), 219 (Windshield Zone Intrusion), and 301-75 (Fuel System Integrity), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-219-02 dated 9 Jan 79. A static rollover test shall be conducted after each barrier impact test for vehicles less than 90 in tall and less than 90 in wide (Dynamic Science rollover fixture limitations).

Dynamic Science, Inc., 1850 West Pinnacle Peak Rd., Phoenix, Arizona 85027
Per Delivery Order
To be completed one (1) year from date of contract award (24 Sep 79)

DOT-HS-9-02277

VEHICLE SAFETY COMPLIANCE, FMVSS NO. 104, WINDSHIELD WIPING AND WASHING SYSTEMS, PASSENGER CARS AND VEHICLES OTHER THAN PASSENGER CARS

Passenger cars, multipurpose vehicles, pickup trucks, and vehicles less than 25,000 lb gross vehicle weight rating (GVWR) and greater than 25,000 lb GVWR shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 104 (Windshield Wiping and Washing Systems), as outlined in National Highway Traffic Safety Administration (NHTSA) Laboratory Test Procedure TP-104-04 dated 16 Sep 74 with the exception of steps 6.4.2.2 through 6.4.2.10, and paragraphs 6.6 through 6.10. Step 6.4.2.18 shall be conducted using layouts supplied by NHTSA.

Approved Engineering Test Laboratories, 1536 East Valencia Drive, Post Office Box 4158, Fullerton, California 92631
Per Delivery Order
To be completed one (1) year from date of contract award (25 Sep 79)

DOT-HS-9-02279

VEHICLE SAFETY COMPLIANCE, FMVSS NO. 104, WINDSHIELD WIPING AND WASHING SYSTEMS, PASSENGER CARS AND VEHICLES OTHER THAN PASSENGER CARS

Passenger cars, multipurpose vehicles, pickup trucks and vehicles less than 25,000 lb gross vehicle weight rating (GVWR) and greater than 25,000 lb GVWR shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 104 (Windshield Wiping and Washing Systems), as outlined in National Highway Traffic Safety Administration (NHTSA)

Laboratory Test Procedure TP-104-04 dated 16 Sep 74 with the exception of steps 6.4.2.2 through 6.4.2.10 and paragraphs 6.6 through 6.10. Step 6.4.2.18 shall be conducted using layouts supplied by NHTSA.

Dynamic Science, Inc., 1850 West Pinnacle Peak Road, Phoenix, Arizona 85027
Per Delivery Order
To be completed one (1) year from date of contract award (25 Sep 79)

DOT-HS-9-02280

VEHICLE SAFETY COMPLIANCE, FMVSS NO. 103, WINDSHIELD DEFROSTING AND DEFOGGING SYSTEMS

Passenger cars shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 103 (Windshield Defrosting and Defogging Systems), as outlined in National Highway Traffic Safety Administration (NHTSA) Laboratory Test Procedure TP-103-09 dated 2 Jul 76 with the exception of steps 4 through 8 of the Test Preparation. Step 10 shall be conducted using windshield layouts supplied by NHTSA.

Approved Engineering Test Laboratories, 1536 East Valencia Drive, P.O. Box 4158, Fullerton, California 92631
Per Delivery Order
To be completed one (1) year from date of contract award (24 Sep 79)

DOT-HS-9-02283

COMPLIANCE TEST PROGRAM, FMVSS NO. 217, BUS WINDOW RETENTION AND RELEASE

Buses (including school buses) shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 217 (Bus Window Retention and Release), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-217-03 dated 13 Jun 79.

Dynamic Science, Inc., 1850 West Pinnacle Peak Road, Phoenix, Arizona 85027
Per Delivery Order
To be completed one (1) year from date of contract award (25 Sep 79)

DOT-HS-9-02284

SUPPLEMENTAL DRIVER SAFETY PROGRAM DEVELOPMENT

Phase 1 is a problem analysis and initial development effort for deriving supplemental driver safety program modules. This effort will include determination of the information that 16-, 17-, and 18-year-old youths need to know and the information that they already have concerning drinking and driving; speeding; restraint usage; hazard perception involving motorcycles, mopeds, pedestrians, and bicyclists; and energy-efficient driving. The effort will involve a review of National Highway Traffic Safety Administration and other (American Automobile Association, National Safety Council, etc.) existing materials to determine their potential to fulfill the information needs of the target group. The needs for new materials and/or procedures will be identified and the initial modules development begun. Phase 2 will be the field testing of materials, procedures, and implementation/promotional strategies. Phase 3 will be the final development of instructional materials and procedures and will include

the development of guidelines for their dissemination, implementation, and promotion. Concentration shall be placed on providing the desired information during the senior year of high school, although the materials (with minor modification) should be appropriate for incorporation into established driver education programs. A third form the materials might take would be mass media presentations as a means of reinforcement and/or presentation of new or additional content material for the target group.

National Public Services Research Inst., 123 North Pitt Street,
Alexandria, Virginia 22314
\$194,537.00
To be completed three (3) years from date of contract award
(28 Sep 79)

DOT-HS-9-02288

COMPLIANCE TEST PROGRAM, FMVSS NO. 105-75, HYDRAULIC BRAKE SYSTEMS

Vehicles other than passenger cars shall be inspected and tested (25 tests with vehicles with a gross vehicle weight rating (GVWR) less than or equal to 10,000 lb, and 25 tests with vehicles with GVWR above 10,000 lb) in accordance with Federal Motor Vehicle Safety Standard No. 105-75 (Hydraulic Brake Systems) as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-105-75-03 dated Jul 78.

North American Testing Company, 1801 Speedway Boulevard,
Post Office Drawer S, Daytona Beach, Florida 32015
Per Delivery Order
To be completed one (1) year from date of contract award (28 Sep 79)

DOT-HS-9-02290

55 MPH INTERSTATE PUBLIC COMMUNICATIONS PROJECT

The State of Florida shall participate in the 55 MPH Interstate Public Communications Project, with the following objectives: to encourage interstate cooperation in developing public communication programs for 55 mph speed limit compliance, to encourage communication efforts aimed at very specific audiences through very specific channels, to encourage the use of communications channels outside of the traditional radio and television public service announcements, and to evaluate the effectiveness of such programs.

Department of Community Affairs, Division of Public Safety
Planning and Assistance, Bureau of Highway Safety, Room 211,
Carlton Building, Tallahassee, Florida 32301
\$199,450.00
To be completed by 30 Sep 81

DOT-HS-9-02291

55 MPH INTERSTATE PUBLIC COMMUNICATIONS PROJECT

The State of Pennsylvania shall participate in the 55 MPH Interstate Public Communications Project, with the following objectives: to encourage interstate cooperation in developing communication programs for 55 mph speed limit compliance, to encourage communication efforts aimed at very specific audiences through very specific channels, to encourage the use of communications channels outside of the traditional radio and

television public service announcements, and to evaluate the effectiveness of such programs.

Highway Safety Group, Pennsylvania Department of
Transportation, 109 Transportation and Safety Building,
Harrisburg, Pennsylvania 17120
\$198,374.00
To be completed by 29 Jan 82

DOT-HS-9-02292

FY80 VEHICLE SAFETY COMPLIANCE, FMVSS NO. 210, SEAT BELT ASSEMBLY ANCHORAGES

Motor vehicle equipment shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 210 (Seat Belt Assembly Anchorages), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-210-06 dated 31 May 79. A closed loop, servo controlled system with automatic feedback shall be utilized in the tests.

Dayton T. Brown, Inc., Church Street, Bohemia, New York
11716
Per Delivery Order
To be completed one (1) year from date of contract award (26 Sep 79)

DOT-HS-9-02293

FY80 VEHICLE SAFETY COMPLIANCE, FMVSS NO. 210, SEAT BELT ASSEMBLY ANCHORAGES

Motor vehicle equipment shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 210 (Seat Belt Assembly Anchorages), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-210-06 dated 31 May 79. A closed loop, servo controlled system with automatic feedback shall be utilized in the tests.

Mobility Systems and Equipment Company, 6151 West Century
Boulevard, Suite 912, Los Angeles, California 90045
Per Delivery Order
To be completed one (1) year from date of contract award (26 Sep 79)

DOT-HS-9-02299

FIELD TEST OF SELF TEST DEVICES (ALCOHOL AND DRUG RESEARCH)

Phase 1 shall involve the conducting of controlled field tests in public establishments and party situations to determine whether giving drivers knowledge of alcohol information in time to modify drinking behavior leads to a reduction in DWI (driving while intoxicated). Voluntary participants shall receive information pertaining to the effects of various blood alcohol concentrations (BAC's) on driving performance, the potential for accident involvement, the legal consequence if apprehended at or above the presumptive BAC level, the procedures for using an alcohol breath self-testing device correctly, etc. Participants will be encouraged to take a self-administered breath test and indicate what their BAC level means in terms of driving performance. Knowledge tests will be used to ensure that alcohol information was received, and unobtrusive observations will be used to test the effects of such knowledge upon DWI behavior. Subjects shall also be questioned about their attitudes on reasons for or against changing their drinking/driving behavior, and potential use of a self-test device. It shall be determined whether desirable changes (monitoring drinking, use of alternative transportation

modes) occurred based on the self-test concept. A prototype self-test device will be fabricated. Phase 2 shall involve fabrication of at least five self-test units for use in controlled field tests, including means of displaying all alcohol and other necessary information. Controlled field tests will again be used to determine the effectiveness of this approach for preventing DWI behavior, as well as consumer acceptability.

Wyle Laboratories, 7800 Governors Drive, West, Huntsville, Alabama 35807

\$222,226.00

To be completed twenty-four (24) months from date of contract award (28 Sep 79)

DOT-HS-9-02296

WRITING POSITION DESCRIPTIONS

Full fact-finding analysis shall be conducted, and position descriptions shall be produced, in the Factor Evaluation System format, for various National Highway Traffic Safety Administration positions. A classification title, series, and grade shall be recommended for each position.

Walter B. Hill, 1903 Barbee Street, McLean, Virginia 22101
Per Task Order

To be completed by 1 Mar 80

DOT-HS-9-02302

FY80 VEHICLE SAFETY COMPLIANCE, FMVSS NO. 214, SIDE DOOR STRENGTH

Passenger cars shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 214 (Side Door Strength), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-214-02 dated 6 Jun 79. A closed loop, servo controlled system with automatic feedback shall be utilized in the tests.

Mobility Systems and Equipment Company, 6151 West Century Boulevard, Suite 912, Los Angeles, California 90045
Per Delivery Order

To be completed one (1) year from date of contract award (27 Sep 79)

DOT-HS-9-02303

FY80 VEHICLE SAFETY COMPLIANCE, FMVSS NO. 214, SIDE DOOR STRENGTH

Passenger cars shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 214 (Side Door Strength), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-214-02 dated 6 Jun 79. A closed loop, servo controlled system with automatic feedback shall be utilized in the tests.

General Environments Corporation, 5515 Cherokee Avenue, Alexandria, Virginia 22312
Per Delivery Order

To be completed one (1) year from date of contract award (27 Sep 79)

DOT-HS-9-02304

IMPROVED LOW BEAM PHOTOMETRICS

Relevant data on low-beam headlamp photometrics and driver performance (U.S. and foreign sources) shall be reviewed, these

data shall be synthesized to derive a recommended low-beam pattern, and a thorough, systematic evaluation of this recommendation shall be provided. The objective is to develop performance specifications for an improved low-beam regulation.

The Regents of the University of Michigan, 260 Research Admin. Bldg., Ann Arbor, Michigan 48109

\$173,615.00

To be completed twenty (20) months from date of contract award (28 Sep 79)

DOT-HS-9-02305

ADVANCED MOTORCYCLE BRAKING

All antilock brake concepts adaptable to motorcycle application shall be surveyed to determine which complete or hybrid system represents the best state-of-the-art system available from a standpoint of performance and cost. Research shall be performed to determine the feasibility of a variable-proportioning system for use with motorcycles. Potentially weak areas of hydraulic disc brakes shall be identified that could be improved to maximize the operator effectiveness in modulating the system to control wheel locking. Performance evaluations shall be made of all fabricated/modified systems to quantify their characteristics. An analysis shall be made of all concepts considered in order to compare objectively advantages and shortcomings of each, including comparative cost.

Systems Technology, Incorporated, 13766 So. Hawthorne Boulevard, Hawthorne, CA 90250

\$145,650.00

To be completed fourteen (14) months from date of contract award (28 Sep 79)

DOT-HS-9-02306

EMERGENCY MEDICAL SERVICES COMMUNICATIONS DESIGN MANUAL

An Emergency Medical Services (EMS) Communications Design Manual shall be developed which will define the design factors and alternatives that should be considered by the EMS planner, and additionally identify the specific implications of the selection of any particular alternative(s). The manual will build on and extend the existing National Highway Traffic Safety Administration Communications Planning Manuals published as annex P and Addendum 1 to the Highway Safety Program Manual Number 11.

Systech Corporation, Codd Professional Building, Severna Park, Maryland 21146

\$29,588.83

To be completed six (6) months from date of contract award (28 Sep 79)

DOT-HS-9-02308

PASSENGER CAR--WET BRAKING PERFORMANCE

Specified wet-stopping performance procedures shall be evaluated to determine their ability in establishing the range of wet-stopping performance capabilities of 1979/80 model year passenger cars. The evaluation minimally shall include the following: number of stops necessary at each test condition, number of passenger cars necessary for testing, and test procedures sequencing. Twelve (12) passenger cars shall be recommended for testing, and after approval, shall be tested in accordance with the specific wet-stopping performance procedures, as modified

and approved. Upon test completion, a report shall be prepared containing vehicle selection criteria, vehicle selection, and test results. The range of wet-stopping performance capabilities of passenger cars shall be determined statistically and its significance to highway safety evaluated. The mechanisms and parameters affecting wet-stopping performance range shall be identified and explained. Problems associated with wet-stopping performance are to be addressed and final cost-effective test procedures, which are capable of determining performance capabilities of passenger cars, recommended. If a significant difference is found in wet-stopping performance range of passenger cars, then highway safety could be improved by publishing these data, thus informing the consumer at time of vehicle purchase.

Dynamic Science, Inc., 1850 West Pinnacle Peak Drive,
Phoenix, Arizona 85027

\$39,008.00

To be completed six (6) months from date of contract award (28 Sep 79)

DOT-HS-9-02309

EVALUATION OF ELECTRIC AND HYBRID 3-WHEELED VEHICLES FOR HANDLING AND STABILITY

Test procedures shall be developed to measure handling and braking characteristics of conventional four-wheeled passenger cars as well as electric vehicles of the three-wheel design. A sample of four conventional passenger cars equivalent in size to the electric cars shall be pilot tested, and baseline data shall be developed to define handling and braking characteristics of vehicles. A sample of electric cars shall be tested and their handling and braking performance compared to that of the conventional vehicles.

Systems Technology, Inc., 13766 S. Hawthorne Boulevard,
Hawthorne, California 90250

\$99,039.00

Undetermined

DOT-HS-9-02310

RELATIONSHIP BETWEEN TRUCK RIDE QUALITY AND SAFETY OF OPERATIONS: METHODOLOGY DEVELOPMENT

After a thorough critical review of the scientific literature, a detailed methodology shall be developed for establishing the relationship between truck ride quality (shock and vibration) and safety of operations. In addition to defining in detail the measurement techniques and procedures for both the independent (ride quality) and dependent (operations safety) variables, the experimental design shall also address such details as numbers of vehicles, drivers, and miles per vehicle per driver; whether desired results can be obtained under the controlled condition of a test track or whether over-the-road testing would be necessary; and data processing, analysis, and interpretation.

Systems Technology, Inc., 13766 South Hawthorne Boulevard,
Hawthorne, California 90250

\$48,391.00

To be completed six (6) months from date of contract award (28 Sep 79)

DOT-HS-9-02312

RELATIONSHIP BETWEEN TRUCK RIDE QUALITY AND DRIVERS' HEALTH: METHODOLOGY DEVELOPMENT

A detailed methodology and experimental design shall be developed for studying the relationship between long-term exposure to shock and vibration experienced by truck drivers and their health. In addition to defining in detail the measurement techniques and procedures for both the independent (ride quality) and dependent (driver's health) variables, the design also shall address such details as number of subgroups representing different levels of exposure to shock and vibration, number of drivers in each subgroup, criterion for estimating total shock and vibration exposure, medical records requirements, techniques and procedures for evaluating the quality of medical information and for processing and analyzing medical information, and data processing, analysis, and interpretation.

Dunlap and Associates, Inc., One Parkland Drive, Darien,
Fairfield, Connecticut 06820

\$46,076.00

To be completed six (6) months from date of contract award (28 Sep 79)

DOT-HS-9-02313

CITIZEN INVOLVEMENT IN TRAFFIC SAFETY PROGRAMS

A study shall be made of citizen involvement programs in traffic safety in order to accomplish the following objectives: assess social and political settings in which highway safety programs operate in order to identify the best uses of citizen participation in traffic safety programs; demonstrate ways in which voluntary organizations and neighborhood groups can contribute effectively to crash reduction; develop a long-range plan by which the National Highway Traffic Safety Administration and the states can increase citizen participation in traffic safety programs; provide a publication for use by local governmental agencies and community groups in developing citizen participation projects for highway safety; and conduct conferences for disseminating training materials to local organizations to increase their participation in safety programs.

The National Center for Citizen Involvement, 1214 Sixteenth
Street, N.W., Washington, D.C. 20036

\$149,560.00

To be completed two (2) years from date of contract award (29 Sep 79)

DOT-HS-9-02314

MOTORCYCLE BRAKE TEST PROCEDURE CHANGES--EQUIPMENT UPGRADE

With regard to Federal Motor Vehicle Safety Standard (FMVSS) 122 (Motorcycle Brake Systems) test procedures, the following objectives shall be accomplished: review the Highway Safety Research Inst. (HSRI) final report on changes to existing test procedures (DOT-HS-5-01264) and FMVSS 122 to identify areas of concentration for improving the equipment and procedures of the unified tow test concept developed by HSRI; study the motorcycle population to develop a motorcycle classification scheme for purposes of brake testing; redesign and simplify the HSRI tow test equipment; revise and define the FMVSS 122 and HSRI test procedures to be compatible with redesigned, t/a Safety Management Institute, motorcycles utilizing the new equipment and procedures.

The Regents of the University of Michigan, 260 Research Administration Building, Ann Arbor, Michigan 48109
\$98,665.00
To be completed twelve (12) months from date of contract award (28 Sep 79)

DOT-HS-7-01537 Mod. 2

VISION TESTER VALIDATION

The reliability and validity of the Mark II Integrated Driver Vision Tester shall be determined. Phase 1 shall involve the development of the strongest possible subset of vision tests from the original battery for subsequent reliability and validity testing. Phase 2 shall involve the determination of the reliability of the Mark II tester. Phase 3 shall involve the test and evaluation of those vision tests which are determined reliable for their validity as indicators of visual deficiencies which are related to high accident involvement. The Mark II vision tests include static acuity-normal; static acuity-low level; dynamic acuity; detection, acquisition and interpretation (DAI); angular movements (CAM, PAM); movement in depth (CMD); field; and static acuity-glare. Approximately 10,000 test subjects shall be involved, and at least four Mark II tester shall be used.

National Con Serv, Inc., t/a Safety Management Institute, Suite 500, 7979 Old Georgetown Road, Bethesda, Maryland 20014
No change
To be completed thirty-six (36) months from date of contract modification (16 Oct 79)

DOT-HS-7-01643 Mod. 5

DEVELOPMENT AND APPLICATION OF ANALYTICAL AND STATISTICAL METHODS IN VEHICLE STRUCTURES RESEARCH II

Vehicle structures research support shall be continued with primary concentration on the formation of a static crush test data base and further user-oriented enhancements of the Data Base Management System.

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."
Increased \$114,916.00
Extended to 30 Sep 80

DOT-HS-7-01708 Mod. 7

SUPPORT FOR ANALYTICAL TOOLS FOR AUTOMOTIVE FUEL ECONOMY ACTIVITIES

To assist the National Highway Traffic Safety Administration (NHTSA) studying the empirical relationships which exist in historical accident data bases between vehicle structural characteristics and injury/fatality modes, existing data bases such as the Fatal Accident Reporting System and the National Crash Severity System shall be processed to produce smaller data sets which will be readily accessible to NHTSA rulemaking personnel for quick response queries. The data extraction procedure and newly created data sets will be documented, and NHTSA personnel will be provided with instruction and training in data access procedures. In addition, the necessary data management tasks will be performed to match existing data files containing vehicle structural characteristics to vehicle descriptors in the accident/fatality data files.

"This contract is awarded by the Small Business Administration under the authority of Section 8(a) of the Small Business Act (USC 637a), and will be administered by the Department of Transportation, National Highway Traffic Safety Administration."
Increased \$48,480.00
Extended through 29 Feb 80

DOT-HS-8-01952 Mod. 2

TRAFFIC LAWS COMMENTARY

A manuscript, in original copy suitable for presentation to a printer, of the first annual supplement for "Traffic Laws Annotated" (Rules for the Road), 1978 Revised Edition, shall be prepared. This manuscript will update the statutory annotations in "Traffic Laws Annotated" to reflect the comparative status of state traffic laws adopted prior to 1 Jan 79 as compared with Chapters 10, 11, and 15 of the latest edition of the "Uniform Vehicle Code" (UVC). A manuscript, in original copy ready for a printer, shall be prepared which will be a new, updated edition of "Driver Licensing Laws Annotated" (DLLA), 1979 Edition. The new edition will replace the main volume first published in 1973. The manuscript will update the statutory annotations in DLLA to reflect the comparative status of state driver licensing laws adopted prior to 1 Jan 79 as compared with Chapter 6 of the latest edition of the UVC. A camera-ready manuscript and three copies of the annual Traffic Laws Commentary entitled "Rules of the Road Rated" shall be prepared. This Commentary will present a current rating of state traffic laws to indicate to what extent they compare with appropriate provisions in the "Rules of the Road" Chapter (Chap. 6) of the UVC. This Commentary will include comparisons of traffic laws in effect in the District of Columbia and the Commonwealth of Puerto Rico and the 50 states as of 31 Dec 78. A camera-ready manuscript and three copies of a Traffic Laws Commentary entitled "State Driver Licensing Laws Affecting Handicapped Drivers" shall be prepared. This Commentary will be based on the latest state statutes on driver licensing as compared with Chapter 6 of the latest edition of the UVC. Legislative topics to be considered include driver ability qualifications and tests for handicapped drivers, license restrictions, options for oral rather than written tests, license reevaluation (period and frequency), and statutory disqualifications applicable to handicapped drivers. The Department of Health, Education, and Welfare's definition of "handicapped" will be used. A final manuscript, in original copy ready for a printer and three additional copies, of a Traffic Laws Commentary entitled "Non-Use of Automobile Safety Belts in Civil Litigation" shall be prepared. This Commentary will update the information appearing on pages 22 through 26 of an earlier Traffic Laws Commentary entitled "Laws Requiring Seat Belts" (Oct 1972, v1 n6) and will include non-use of safety belts as negligence, contributory negligence, or as a factor in diminishing damages the non-user may collect from a negligent driver.

National Committee on Uniform Traffic Laws and Ordinances, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036
Increased \$114,000.00
Extended to 30 Sep 80

DOT-HS-8-01994 Mod. 2

VISION TESTER VALIDATION

Maintenance and technical advice for the Mark II B Vision Testers used in support of the validation study shall be provided as follows: repair of the devices when major equipment troubles occur that are beyond the technical competence of the machine

users; routine maintenance, adjustment, cleaning, and lubrication of the devices as needed; revised version of Maintenance Manual, an accurate electrical schematic, and computer test points of the machines; Researchers Manual that includes the minicomputer parameters, operating and control modes, and test and setup values; and consultation, advice, and, where necessary, modifications to vision tester areas that require expertise not available to the users.

Honeywell, Inc., Systems and Research Center, 2600 Ridgeway Parkway, Minneapolis, Minnesota 55413
Increased \$25,000.00
Indefinite

DOT-HS-9-02278

**COMPLIANCE TEST PROGRAM, FMVSS NO. 104,
WINDSHIELD WIPING AND WASHING SYSTEMS,
PASSENGER CARS AND VEHICLES OTHER THAN
PASSENGER CARS**

Passenger cars, multipurpose passenger vehicles, pickup trucks, and vehicles with GVWR (gross vehicle weight rating) less than 25,000 lb and vehicles with GVWR greater than 25,000 lb shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard 104 (Windshield Wiping and Washing Systems), as outlined in National Highway Traffic Safety Administration (NHTSA) Laboratory Test Procedure TP-104-04 dated 16 Sep 74 (with the following modifications: delete steps 6.4.2.2 through 6.4.2.10, conduct step 6.4.2.18 using layouts supplied by NHTSA, and delete paragraphs 6.6 through 6.10).

Dayton T. Brown, Inc., Church Street, Bohemia, New York 11716
Per Delivery Order
To be completed by 25 Sep 80

DOT-HS-9-02282

**COMPLIANCE TEST PROGRAM, FMVSS NO. 111,
REARVIEW MIRRORS FOR PASSENGER CARS**

Passenger cars shall be inspected and tested in accordance with Federal Motor Vehicle Safety Standard No. 111 (Rearview Mirrors), as outlined in National Highway Traffic Safety Administration Laboratory Test Procedure TP-111-02 dated 29 Nov 78.

Mobility Systems and Equipment Company, 6151 West Century Boulevard, Suite 912, Los Angeles, California 90045
Per Delivery Order
To be completed by 24 Sep 80

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